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MISCELLANEOUS INFORMATION.

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XXXV.—THE GRASSES OF BRITISH SOMALILAND.

OTTO STAPF.

When in 1888 the first list* of plants from what is now British Somaliland was published, not a single species of grasses was known from that country, and indeed very few from the remainder of the Somali Peninsula. But although the members of the James Expedition, from whose collections that list was drawn up, did not bring home any grasses, there are passages in F. L. James's book "The Unknown Horn of Africa" which refer to the occurrence of grass lands in the interior. To throw light on their character and constitution was reserved for the Italian expeditions of L. Robecchi-Bricchetti and Prince Ruspoli, who between 1890 and 1893 did so much towards lifting the veil from the interior of the peninsula.

The grasses collected by Robecchi-Bricchetti on his journey from Obbia to Berbera were published by Dr. E. Chiovenda in 1896.† The majority (14 species) of them are from British territory and were gathered in the western Haud and the Habr Awal country in the last two weeks of August, 1891. In the same year, Prof. Keller, of Zürich, who accompanied Prince Ruspoli on his first expedition, botanised in that region; but only one or two grasses,‡ new species described from his collections, can be claimed for British Somaliland.

The next contribution to our knowledge of Somali grasses was by Dr. Riva, Prince Ruspoli's naturalist on his second expedition.

* Oliver in F. L. James, "The Unknown Horn of Africa" (1888), pp. 318–323, tt. 1–4.

† E. Chiovenda, Graminaceae dell' Harar e dei Somali racallte dell I. L. Robecchi-Bricchetti in Annuario del R. Istituto Botanico di Roma, vi. (1896), pp. 161–176, tt. ix.–xxi.

‡ Hackel in Mémoirs de l'Herbier Boissier, No. 20 (1900), pp. 6–8.

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His collections were made in December, 1892, on the journey from Berbera through the Habr Awal country and the Haud to Milmil, which latter place is well south of the British boundary. They belong to only three, or possibly five, species which were enumerated by Dr. Chiovenda* in 1897. If we add a species gathered by Robecchi-Bricchetti on a former journey on the western frontier of British Somaliland, the number of grasses thus made known from the Protectorate amounts to fewer than 20. The north-eastern part of the Protectorate from Lasgori to the Ahl Mountains and from Maid to Jebel Serut was explored botanically by J. M. Hildebrandt as long ago as 1871 and 1873 respectively. No list of the plants collected on those occasions was published; but from Hildebrandt's set at Kew and Prof. Engler's references in his sketch of the vegetation of the Somali Peninsula† it appears that the grasses were represented in his collections by not more than eight species. Including Hildebrandt's grasses mentioned by Engler and a new species described by Dr. Rendle from Mrs. Lort-Phillip's collection we have still less than 25 species of *Gramineae* on record from the whole of British Somaliland.

Material has, however, been accumulating at Kew during the last twelve years which allows us to form a better idea of the general character and composition of the grass vegetation of British Somaliland and to some degree also of its economic value. Some information as to the extent of grass land, all of which has to be classed as grass steppe, may also be gleaned from the reports of travellers who did not themselves collect.

It is proposed to give in this paper a general account of all that can be grasped concerning the grasses of British Somaliland, from the published as well as the unpublished evidence at our disposal. As to the latter, it consists mainly of three sets of plants at Kew. Of these I have to mention in the first place the collection of Mrs. Lort-Phillips and Miss Edith Cole. Both botanised in the country between Berbera and the upper parts of the Golis Range from February to April, 1895. In 1897 Mrs. Lort-Phillips visited the same district and the Waggar Mountains. A considerable number of new species, discovered on both occasions, was described by the botanists of Kew and the British Museum, among them being, however, only one grass, *Chloris somalensis*, Rendle. I have now to record 26 species out of the collections made by these two ladies, and mostly by Mrs. Lort-Phillips. No fewer than 21 of them were unrepresented in the earlier collections. Unfortunately many of their species were neither localised nor accompanied by notes as to the conditions of their habitats, frequency, association with other plants and other particulars which can only be supplied by the observer in the field. Another very important collection of grasses was made in Somaliland by Lieut.-Col. A. F. Appleton, Army Veterinary Department, who was attached to General Manning's Force during the operations against the Somalis from 1902 to 1904. Apart from a few specimens

* E. Chiovenda, Graminaceae somalenses a Dre. D. Riva in expeditione Ruspoliana lectae in Annuario del R. Istituto Botanico di Roma, vii. (1897), pp. 58–78, tt. iii.–vii.

† Engler, Über die Vegetationsverhältnisse des Somalilandes in Sitz. Ber. Preuss. Ak. Wiss. 1904, x., pp. 355–416 (reprint 1–62).

collected in Italian territory, the whole collection was made between Bohotle and Berbera and comprises 31 species, several of which are new to science. Col. Appleton, who from his special duties was naturally interested in questions of forage, paid particular attention to the grasses, and attached valuable notes to his specimens concerning their quality as fodder plants. He also added occasionally observations on their mode of growth, and carefully localised the samples. A third set of Somali grasses was received in several instalments through the Colonial Office and the Imperial Institute in 1905 and 1906. They were collected by Dr. R. E. Drake-Brockman, mostly in the Golis Range. The only notes accompanying these specimens refer to vernacular names, which ought to prove very useful for practical purposes. Dr. Drake-Brockman's collection yielded over 40 species of grasses. Of other Somali collections which have provided material for this paper I may mention those of Major D. Thomson, 128th Pioneers, and of Fleet-Paymaster W. Wykeham Perry. The former collected in the Haud in 1903 (three species), whilst the latter's grasses (two species) were gathered near Berbera in 1878.

As might be expected, the climatically favoured mountain ranges which separate the littoral zone from the Haud, the plateau land of the interior, have yielded the greatest number of species. But it is precisely in the interior that the grass steppe attains its greatest development, covering immense tracts, as in Toyo, or alternating with tree steppe and thorn bush, or passing into desert. The sketch map of Northern Somaliland by Aylmer, Parkinson and Brander Durbar in the Geographical Journal for 1898 (p. 112) characterises Toyo as an "immense open treeless grassy plain." North-east of it "a treeless grassy plain" is shown to extend as far as the Tug Der, and due east of the Toyo we find "trees, open patches and tall Durr grass" (*Andropogon cyrtocladus*). A "short grass plain with little or no jungle" is entered in the same map east of Burao and a "rich grass plain" still farther east at the foot of the Artalla Range. Further exploration will, no doubt, considerably raise the number of grass species represented in the Haud ; but at the same time it is probable that gregariously growing grasses prevail there to some degree, making up by number of individuals for what they lack in variety.

The list of grasses given here comprises 82 species. This is a very considerable number, when the imperfect exploration of the Protectorate is taken into account.

For comparison it may be mentioned that the United Kingdom and Ireland, with an area almost twice as large as that of British Somaliland, possess 135 species of grasses (7·25 per cent. of their phanerogamic flora), Italy, with its immensely rich and varied flora and an area 1·6 times as large, 285 (7 per cent.) and Egypt proper, six times the size of the Protectorate, 143 (11 per cent.). In its composition this grass flora is thoroughly tropical, practically all the species belonging to tribes which are characteristic of the tropical floras and of their intrusions into the temperate zones. Thus *Paniceae* number 23, the *Sporoboleae* and *Eragrosteae* together 15, *Chlorideae* 13, *Andropogoneae* 12 species, whilst genera which could be classed as boreal types are entirely absent. The close affinity of the Somali flora to that of Eritrea and

tropical Arabia finds a striking expression in the number of grasses common to those areas. Out of the 67 non-endemic species of British Somaliland no fewer than 45 (67 per cent.) have been found in all three countries, whilst 49 (73 per cent.) occur in Eritrea and 9 more in the adjacent parts of Abyssinia and Nubia, and 48 (72 per cent.) are recorded from tropical Arabia. If we finally consider the grasses which occur in British Somaliland and at the same time appear either in Eritrea and the immediately adjoining districts or in tropical Arabia, we find that no fewer than 60 (91 per cent.) out of 67 non-endemic species come under the heading. There is therefore no doubt that, so far as the grasses are concerned, Somaliland proper and Eritrea with Eastern Nubia on the one, and tropical Arabia on the other side of the Red Sea form a natural unit. Similar conditions also prevail in other respects, marking out that area as a distinct phyto-geographical province which might appropriately be called the Erythraean Province. It would naturally include, although as a well characterised subdivision, the Island of Socotra. It is true that of the total of 50 non-endemic grasses known from Socotra only 20 have been recorded from British Somaliland, and indeed from the whole of the Somali Peninsula; but on the other hand the island has 34 (68 per cent. of the non-endemic element) in common with tropical Arabia and as many, and mostly the same species, with Eritrea. The latter, as well as tropical Arabia, are far better explored than Somaliland, and this may account sufficiently for a greater number of Socotra grasses having been found there than in the Protectorate.

If we go beyond the limits of the Erythraean Province and take a broad survey of the grass flora of Somaliland with respect to more distant affinities, we find that its character quite fits in with the position of the Erythraean Province as a division of the great steppe and desert belt, which extends from the Cape Verd Islands and Senegambia to the Indus, exhibiting a stronger leaning towards India than towards the West. The number of grasses common to British Somaliland and India is 40, 11 of which do not occur west or south of the Erythraean Province. On the other hand, 36 extend to Senegambia or the Cape Verd Islands; most of the latter are, however, species having a wide distribution, or at least ranging eastwards and southwards of the Somali Peninsula.

The relationship with India will no doubt appear still more accentuated when the species which Socotra has in common with Arabia and Eritrea but not, so far as our present records go, with British Somaliland, may have been discovered there, a contingency that is to be expected as they are practically all members of the Indian flora.

As might be expected, a considerable number (31 and 25 respectively) of the species extends southwards into East Africa and even South Africa, but here again most of them are species of a wide range, only five or six being limited to the Erythraean Province and East Africa. The isolation of the Somali Peninsula from the African Hylaea region is very strikingly shown by the small number of species which extend into it. If we except the grasses of more or less cosmopolitan character or of at least general

distribution in the tropics of the Old World, there are only four left which enter the Hylaea (*Panicum maximum*, *Tricholaena rosea*, *Sporobolus festivus* and *Eragrostis aspera*) none of them, however, peculiar to it. Of species whose areas are chiefly in the northern temperate zone *Erianthus Ravennae* is of interest in so far as its occurence in Somaliland is the only instance of its extension into the tropics. It is found throughout the Mediterranean region, in Central Asia and North-eastern India, frequently in the neighbourhood of streams, just as in Somaliland. Another more temperate type is *Aeluropus repens*, a halophilous grass which is mainly a native of the Mediterranean region, but in India has found its way into the tropics, ranging along the shores of the Deccan Peninsula as far as Ceylon.

The endemic element is represented by 15 species of which *Andropogon Kelleri* and *A. cyrtocladus* form (together with *A. Bentii* from Socotra) a marked little group not found anywhere else. All the other species peculiar to British Somaliland have their nearest allies in groups which are represented, and mostly well represented, in the Erythraean and the adjoining provinces, so that the endemism of the grasses is not of a very high order.

Physiologically the grasses of Somaliland may be considered as distinctly xerophilous types, mostly fitted for the prolonged droughts by long resting periods during which they are reduced to dry stubble or by annual habit with a very short vegetative cycle. The latter class is, however, represented by 14 species only, more than half of which are cosmopolitan. The tall rank grasses so characteristic of the steppes of tropical Africa are almost absent and are replaced by forms which rarely exceed 1 m. and in many cases are under 0·5 m. A notable exception is *Andropogon cyrtocladus*, the Durr of the Somalis, which attains a height of 2–2·5 m. and is further distinguished by its shrubby habit and copious branching. The branches are like those of *A. Kelleri*, which is, however, a prostrate grass, slender, wiry and hard. Colonel Appleton records that "in the dry season the leaves and young shoots fall off," a peculiarity which it shares, according to the same collector, with *Chrysopogon Aucheri*. The production of foliage by these grasses after the rains have set in, is very considerable, as can be seen from the herbarium specimens. Colonel Appleton describes them as "forming large feathery bunches." The internodes of the young foliage-branches are very short and the finely acuminate and by no means coarse leaf-blades are crowded into tufts. *Sporobolus fruticulosus*, another shrubby grass, seems to behave similarly. This rapid and abundant growth of rather tender foliage appears to be characteristic of many Somali grasses. Other grasses, like *Panicum turgidum* and *Pennisetum dichotomum* have persistent culms which remain green even during the dry season, and form, although stiff and tough, an important fodder supply for the hard-mouthed camel. There is no doubt that the considerable mammalian fauna of Somaliland as well as the flocks and herds of the roving nomads for their sustenance depend to a great extent on this grass vegetation, not only during the rainy season but also later on when it is reduced to stubble.

In a country with so small a rainfall and so little surface water the distribution of underground water must obviously play a great part in the distribution of the vegetation. Accordingly we see the grasses gather in the wadis and in the neighbourhood of the wells, except in the higher mountain ranges where the conditions are favourable for a more general expansion. There are also, however, grasses which are evidently specially adapted to the rigours of excessive heat and drought in a table land of so monotonous a configuration as that of the Haud. The usual arrangements for the regulation and restriction of transpiration manifest themselves sufficiently in the xerophilous facies of their overground parts; but there must be an additional apparatus in the underground system enabling them to draw from the soil the last particles of moisture. In respect to this, however, we know next to nothing.

The grass vegetation of a country like Somaliland is, of course, one of its mainstays and is a great natural asset. To know its extent and its composition is of extreme importance. One object of this article is, as already stated, to bring together all that is known or can be learned from material as yet unused. Another object, however, is to invite further exploration on more extensive lines, and in order to give the non-professional collector some help in this direction a paragraph concerning the collecting of grasses has been added. With respect to the economic value of the grasses few can be expected to have the opportunities and the experience of Colonel Appleton. Much could, however, be learned by careful observation and from the natives, who are generally good judges in such matters. I have carefully quoted Colonel Appleton's notes, and also when possible referred to Mr. Duthie's book on the fodder grasses of Northern India which contains much valuable information, and considering the great affinity of the grass floras of Somaliland and Northern India, will be found generally useful. This is about all that can be done in this direction as long as our knowledge of the nutritive value of tropical fodder plants is so imperfect and crudely empirical. A curious instance of a grass alleged to be poisonous is that of *Dactyloctenium glaucophyllum*. It deserves further investigation by a competent chemist and physiologist.

Finally I would refer to the importance of collecting the vernacular names of the grasses. I have quoted all the names given by Robecchi-Bricchetti, Appleton, and Drake-Brockman and it will be seen that there are remarkably few cases of contradiction. This points to careful discrimination and accuracy in the application of names by the native inhabitants. To make the spelling of the geographical names uniform, I have adopted the system used in the map prepared by the Intelligence Department of the War Office.

Enumeration of Somaliland Grasses.

Erianthus Ravennae, *Beauv.*, var. **purpurascens**, *Hack.*; Hook. f., Fl. Brit. Ind. vii., 121; Duthie, Fodd. Grass. N. Ind., 26; Chiovenda in Ann. Ist. Bot. Roma, vi., 164 and vii., 58.

Between Hargeisa and Berbera, *Robecchi*; plains of "Scek" (Au Bakhadle, N.E. of Hargeisa), in isolated tufts or in thickets

by the torrent, or forming extensive borders along it, *Riva*, 49; between Derra Godeli and "Lafane" (Lafarrug ?) by a stream, *Riva*, 19; without precise locality, *Drake-Brockman*, 4, 35.

VERN. *Aibarli* (Drake-Brockman).

DISTR. (of the species). Mediterranean region to the Panjab and Turkestan.

Arthraxon lanceolatus, *Hochst.*, var. **serrulatus**, *Hack.*; Hook. f., l.c. 143.

Without precise locality, *Drake-Brockman*, 12, 22.

VERN. *Horrajar* (Drake-Brockman).

DISTR. (of the species). Abyssinia to Tonkin and China.

Ischaemum laxum, *R. Br.*, var. **genuinum**, *Hack.*; Hook. f., l.c. 136; Duthie, Fodd. Grass. N. Ind. 31, Ill. t. 58.

Golis Range, *Drake-Brockman*, 133, 183.

DISTR. (of the species). Cape Verd Islands to India and tropical Australia.

Andropogon foveolatus, *Del.*; Hook. f., l.c. 168; Duthie, Fodd. Grass. N. Ind. 34, Ill. t. 21.

Berbera, *Perry*.

DISTR. Cape Verd Islands to the Panjab.

A. Kelleri, *Hack.* in Mem. Herb. Boiss. No. 20, 8.

Toyo, *Keller*.

DISTR. Endemic.

A. cyrtocladus, *Stapf*, sp. nov., sect. *Arthrolophis*; *A. Kelleri* arcte affinis, sed erectus, 2–2·5 m. altus et racemis 2-natis majoribus, spiculis hermaphroditis 7 mm. longis, valva inferiori 3-nervi, palea eciliata, spiculis masculis majoribus, antheris 4 mm. longis distinctus.

Shrub, up to over 2 m. high, much branched, many-noded; main culms and branches usually ascending in curves, glabrous, terete, hard; lower internodes more or less exserted from the persistent or slowly decaying sheaths, whitish glaucous, up to 7 cm. long, upper enclosed, much shorter to very short. *Leaves* crowded on the young branches, forming "feathery bunches," or more or less distant, glabrous; *sheaths* terete, tight, firm, smooth, finely striate, persistent; *ligule* a minute, membranous rim; *blades* attenuated from the slightly rounded base (2 mm. wide), into a long setaceous point, 2–3·5 cm. long, more or less glaucous, firm, smooth, with about 7 primary nerves alternating with very fine secondary ones. *Peduncles* slender, 5–10 cm. long, more or less exserted from the uppermost bladeless or nearly bladeless sheath, with a tuft of hairs at the upper end. *Racemes* paired, one sessile, the other on a slender peduncle (5–6 mm. long), subparallel, silky, 2·5–3 cm. long, densely hairy all over the back and edges; hairs white, very fine, the longest as long as the joint; pedicels similar to the joints, 4 mm. long. *Sessile spikelets* linear-lanceolate, acuminate, 6–7 mm. long, sometimes purplish; *glumes* thin, glabrous, *lower* minutely truncate, slightly concave on the

back, nerveless between the fine, minutely scabrid keels, *upper* boat-shaped, 3-nerved, shortly aristulate, margins minutely ciliate upwards; *lower valve* almost lanceolate, acute, 6 mm. long, hyaline, 1-nerved, minutely ciliate, *upper* lanceolate, 5 mm. long, deeply bifid, 1-nerved, awn about 15 mm. long, kneed at or below the middle, glabrous; *palea* ovate, nerveless, 1·5 mm. long, glabrous; *anthers* 4 mm. long; *stigmas* 2·5 mm. long. *Pedicelled spikelets* male, linear-lanceolate, 7 mm. long, glabrous, purplish; *glumes* thin, *lower* shortly aristulate with 3 stronger and 3–4 very fine nerves, ciliate, *upper* hyaline, 3-nerved, ciliate, 6 mm. long; *valves* hyaline, 1-nerved, 6–5 mm. long.

VERN. *Durr* (Appleton, Drake-Brockman).

Without precise locality, *Drake-Brockman*, 43, 44. "Dur: grows to 6 or 8 feet in great feathery bunches. Very plentiful in the Haud and at Bohotle. A valuable camel feed."—*Appleton.* To this species refers possibly, at least in part, another note, written by Col. Appleton against a specimen of *Sporobolus fruticulosus*, which by mistake had been mounted with his specimen of "Durr." It runs "Grows thickly in most parts of Italian Somaliland (between Obbia and Bohotle), also less freely in the Haud and British Somaliland. After rain it forms large feathery bunches of green. In the dry season the leaves and young shoots fall off, leaving the stubble on which our horses grazed until the rain came. The best grass in Somaliland." The specimen of the *Sporobolus* referred to resembles a dwarfed "Durr," but the anatomy of the leaves and the presence of a few withered inflorescences are sufficient to recognise it. "Tall Durr" is also mentioned in Aylmer's map (*see* p. 205) as occurring in patches in the Haud, east of Toyo.

Hackel placed the closely allied *A. Kelleri* in the section *Schizachyrium*, where it was supposed to occupy an isolated position. He was probably led to do so by the solitary racemes. The same condition is characteristic of *A. Bentii*, from Socotra, which I describe at the end of the paper. The close affinity of the three species *A. cyrtocladus*, *A. Kelleri* and *A. Bentii* is, however, evident from their general appearance as well as from the structure of their racemes and spikelets. The latter refers them unmistakeably to the section *Arthrolophis*, within which they form a small group of well-marked habit, approaching in their technical characters more the American *A. glaucescens*, Kunth, and *A. incanus*, Hack., than any of their African congeners. Among the latter *A. appendiculatus*, Nees, has probably most in common with them.

A. Ischaemum, *L.*, var. (?) **somalensis**, *Stapf*, var. nov.; a typo spiculis paulo minoribus (3 mm. longis), articulis 2 mm. longis, spiculis pedicellatis valva superiore destitutis neutris distinctus.

"At Burao and Upper Sheikh, grows two feet high, and is a good feed."—*Appleton.*

The specimens consist only of a few culm tops and inflorescences. The racemes are on the whole so similar to those of *A. Ischaemum* (var. *genuinum*, Hack.) that I hesitate to base a new species on the differences which I have indicated. Yet it is quite possible that it will have to be treated as specifically distinct when

complete material comes to hand. I would add that the nodes are glabrous as in typical *A. Ischaemum*. For the species see Hook. f., Fl. Brit. Ind. vii., 171, and Duthie, Fodd. Grass. N. Ind. 35, Ill. t. 22.

DISTR. The typical form from South and Central Europe to North India and China.

A. pertusus, *Willd.*; Hook. f., l.c. 173; Duthie, Fodd. Grass. N. Ind. 38, Ill. t. 25.

Golis Range, *Drake-Brockman*, 128.

DISTR. From Abyssinia to North Australia, and southwards through East Africa to Natal.

Chrysopogon Aucheri, *Stapf.*—Syn. *Andropogon Aucheri*, Boiss.; Hook. f., Fl. Brit. Ind. vii. 195.

—— var. **quinqueplumis**, *Hack.*; Chiovenda, in Ann. Ist. Bot. Roma, vi., 164.

Habr Awal country, *Robecchi*. "Grows in small feathery clumps in the plains of British Somaliland. When the hot weather comes the leaves fall off, leaving a kind of stubble from 4 to 5 inches long, on which animals feed."—*Appleton*.

DISTR. (of the species). Abyssinia to the Panjab.

Col. Appleton also collected several panicles of what seems to be a form of this variety with somewhat smaller, dark purplish spikelets. He says of it: "This grows in tufts with an abundance of green leaves, forming an excellent feed. It requires very little water, grows freely in patches round Little Bohotle, but is frequently met with on the road from Gararo to Upper Sheikh." The same form was found by Dr. Drake-Brockman in the Golis Range (153). His specimens are very complete. They consist of dense bundles of underground branches dividing, where they emerge from the soil, into short barren, densely leafy shoots, and forming, as Col. Appleton says, "tufts with an abundance of green leaves." The leaves are 1-1·5 cm. long, and the flowering culms springing from the cushion-like tufts are about 25 cm. high. Typical *C. Aucheri* var. *quinqueplumis* from Afghanistan and Beluchistan occasionally exhibits a similar mode of growth.

Heteropogon contortus, *Roem. & Schult.*; Duthie, Fodd. Grass. N. Ind. 32, Ill. t. 19.—Syn. *Andropogon contortus*, L.; Hook. f., l.c. 199; Chiovenda, l.c. vii., 61.

Berbera, *Riva*, 449; Golis Range, *Drake-Brockman*, 84, 88, and without precise locality, *Drake-Brockman*, 25. "Speargrass from Upper Sheikh; common also round Galkayo and usually found near Burao. Causes much trouble to ponies, the spears sticking in their mouths."—*Appleton*.

VERN. *Aggar* (Drake-Brockman).

DISTR. All tropical countries, also in the Mediterranean.

Cymbopogon commutatus, *Stapf.*—Syn. *Andropogon commutatus*, Steud., Chiovenda, l.c. vii. 61.

Golis Range, *Drake-Brockman*, 121, 126. "Found in small quantities round Upper Sheikh and between Upper Sheikh and Burao."—*Appleton*.

DISTR. Eritrea to Afghanistan and Sind.

Chiovenda quotes a specimen collected by Riva (315) in Ogaden under this species. Engler mentions it from the Haud. The species probably occurs throughout the peninsula. It is a very close ally of *A. Schoenanthus*, Spr., which has the reputation of being a good fodder grass. *See* Stapf in Kew Bull., 1906, p. 310.

Cymbopogon hirtus, *Nees ex Baker.*—Syn. *Andropogon hirtus*, L.

Golis Range, *Drake-Brockman*, 186; and without precise locality, *Drake-Brockman*, 34; Waggar Mountains, Gedais, in an almost dry river bed, at 1,700 m., *Lort-Phillips.*

VERN. *Dailan* (Drake-Brockman).

DISTR. In several varieties all over Africa and in the Mediterranean region.

Themeda Forskalii, *Hack.*, var. **punctata**, *Hack.*

Daraas, *Cole.*

—— var. **imberbis**, *Hack.*; cf. for the species Duthie, Fodd. Grass. N. Ind. 43 and (sub. *Anthistiria imberbis*), Hook. f., Fl. Brit. Ind. vii. 211.

Without precise locality, *Lort-Phillips.*

DISTR. (of the species). All over Africa, India, and Malaya to Australia.

Mrs. Lort-Phillips' specimen has densely bearded nodes. The lower sheaths and exserted portions of the lower internodes are also more or less hairy.

Paspalum distichum, *L.*; Hook. f., l.c. 12.

"Found round Burao and on the road to Upper Sheikh, and at Lower Sheikh and Behindula. Height 6 to 8 inches. A good grazing grass."—*Appleton.*

DISTR. Sporadically throughout the tropics, usually a shore plant.

Digitaria eriantha, *Steud.*

Wadaba, *Cole.*

DISTR. (of the species). From the Canaries to North-western India and southwards through East Africa to the Cape.

The Mediterranean and Indian forms represent slight modifications of the type. The Indian variety, originally described as *Panicum pabulare*, Aitch. & Hemsl. (Syn. *Paspalum sanguinale*, var. *pabulare*, Hook. f., l.c. 15) is described by Aitchison as the "best fodder-grass for cattle" in the Kuram District.

D. horizontalis, *Willd.*

Golis Range, *Drake-Brockman*, 157. "A free growing grass with plenty of leaf, found principally round Galkayo, but also at Burao and Upper Sheikh; considered a good feeding grass." —*Appleton.*

DISTR. Tropical Africa and Tropical America.

D. sanguinalis, *Scop.*, var. **ciliaris**.—Syn. *Paspalum sanguinale*, var. *ciliare*, Hook. f., l.c. 15; *Panicum sanguinale*, var. *ciliare*, Duthie, Fodd. Grass. N. Ind. 12, Ill. t. 9.

"Found in the valleys round Upper Sheikh; grows to 3 feet, and is a good feed."—*Appleton.*

DISTR. Almost cosmopolitan.

D. longiflora, *Pers.*—Syn. *Paspalum longiflorum*, Hook. f., Fl. Br. Ind. xiii., 17. *Panicum tenuiflorum*, Duthie, Fodd. Grass. N. Ind. 13.

Golis Range, *Drake-Brockman*, 150.

DISTR. Tropics of the Old World.

D. Rivae, *Stapf.*—Syn. *Panicum Rivae*, Chiovenda in Ann. Ist. Bot. Roma, vii. 62, t. III., fig. ii.

Ogaden Desert, *Riva*, 303. Haud, according to Engler (Veget. Somaliland in Sitz. Ber. Preuss. Ak. Wiss., 1904, 41 of reprint).

DISTR. Endemic.

D. abyssinica, *Stapf.*—Syn. *Panicum* (*Digitaria*) *abyssinicum*, Hochst. ex A. Rich., Tent. Fl. Abyss. 11, 361.

—— var. **scalarum**, *Stapf.*—Syn. *Panicum* (*Digitaria*) *muticum*, Schimp. ex A. Rich. l.c. 362, non Forsk. *P. scalarum*, Schweinf. in Bull. Herb. Boiss. II., ii., 20. *P. scalarum*, var. *elatior*, Chiovenda in Ann. Ist. Bot. Roma, vi., 166, t. 9. *P. kafuroënse*, K. Schum. in Engl. Jahrb. xxiv., 334.

Habr Awal country, *Robecchi.*

DISTR. Abyssinia and tropical Arabia to Uganda and British East Africa.

Panicum geminatum, *Forsk.*

"Found in Upper and Lower Sheikh and Burao in small quantities."—*Appleton.*

DISTR. Somaliland to Nubia and tropical Arabia.

P. leersioides, *Hochst.*

"Found in fairly large quantities in bundles of grass brought from the valleys above Upper Sheikh; grows to 3 feet, and is a good feed."—*Appleton.*

DISTR. From Nubia and tropical Arabia southwards to Mozambique.

P. serratum, *Spreng.*, var. **gossypinum**, *Hack.*

Without precise locality, *Lort-Phillips.*

DISTR. (of the species). From Eritrea through East Africa to the Cape, westwards to Northern Nigeria.

P. maximum, *Jacq.*; Hook. f., Fl. Brit. Ind. vii., 49; Kew Bull., 1894, 382, and 1897, 210; Chiovenda, l.c. vi., 166.—Syn. *P. jumentorum*, Pers.; Duthie, Fodd. Grass. N. Ind., 9.

Between Hargeisa and Berbera, *Robecchi*; and without precise locality, *Drake-Brockman*, 7, 21. "Grows at Bohotle, near Burao, and in the valley beyond Upper Sheikh. Height about 3 feet; considered a good feed."—*Appleton.* Jebel Serrut, 1,600 m., *Hildebrandt*, 1482.

DISTR. All over tropical and South Africa, also in tropical Arabia; cultivated and naturalised in many tropical countries.

This is the so-called "Guinea grass," cultivated in many parts of the tropics as one of the most valuable fodder plants.

P. coloratum, *L.* (forma minor).

"Grows near water at Bohotle, Burao, and Upper Sheikh; height about 1 foot; a poor feed."—*Appleton.*

DISTR. From Egypt through East Africa to the Zambesi, also in tropical Arabia.

A similar small state is represented by a specimen collected by Höhnel in Pare, German East Africa, and distributed as "*Panicum Dregeanum*, Nees., var. *glabratum*, Schweinf."

P. repens, *L.*; Hook. f., Fl. Brit. Ind. vii. 49; Duthie, Fodd. Grass. N. Ind. 11.

Golis Range, *Drake-Brockman*, 98.

DISTR. Throughout the Mediterranean region and India to China and Malaya; in Africa chiefly along the West Coast to South Africa.

P. turgidum, *Forsk.*; Chiovenda, l.c. vii., 166.

Between Hargeisa and Berbera, *Robecchi*; without precise locality, *Lort-Phillips*, *Drake-Brockman*, 3, 42.

VERN. *Dungara* (Robecchi), *Dungarr* (Drake-Brockman).

DISTR. From the Senegal to tropical Arabia.

A valuable fodder for camels. It often covers large tracts.

Setaria aurea, *A. Br.*

Golis Range, near Daraas, in water-courses, 1,500 m., *Lort-Phillips.*

DISTR. Throughout tropical and South Africa.

The perennial *S. aurea*, one of the commonest grasses of the African savannas, is, perhaps, the mother plant of the annual and almost cosmopolitan *S. glauca*, Beauv. Concerning this see Hook. f., Fl. Brit. Ind. 78; Duthie, Fodd. Grass. N. Ind. 14, Ill. t. 10.

S. verticillata, *Beauv.*, subsp. **Aparine**, *A. Braun*; Chiovenda, l.c. vi., 167. Cf. *S. verticillata*, Hook. f., l.c. vii., 80; Duthie, Fodd. Grass. N. Ind. 15.

Habr Awal country, *Robecchi*; Golis Range, *Drake-Brockman*, 171.

DISTR. (of the species). Throughout Africa, India and Melapa, otherwise as a weed.

Pennisetum ciliare, *Link.*—Syn. *P. cenchroides*, Rich.; Hook. f., Fl. Brit. Ind. vii., 88; Duthie, Fodd. Grass. N. Ind. 17, Ill. t. 12, 13.

Golis Range, *Drake-Brockman*, 166; without precise locality, *Cole*, *Drake-Brockman*, 20. "Grows in the valleys round Upper Sheikh. Height from 1–1½ ft. A good feeding grass."—*Appleton.* Ahl mountains, up to 2,000 m. *Hildebrandt* (according to Engler).

VERN. *Arabjeb* (Drake-Brockman). *See* also under *P. Ruppellii.*

DISTR. From Senegambia to North-west India and through East Africa to the Cape.

Chiovenda (l.c. vii., 66) described a variety *anachoretica* from specimens collected by Riva in the Ogaden desert (in the Haud, according to Engler). It is stated to differ from the typical form in having smaller, unispiculate involucres and unequal glumes; but as Riva's specimens were diseased, the differences may very well be due to the anomalous condition of the grass.

P. dichotomum, *Del.*; Hook. f., Fl. Brit. Ind., vii., 85.

Maid, in the coast plain, *Hildebrandt*, 1481.

DISTR. From Algiers to North-western India.

P. Ruppellii, *Steud.*—Syn. *P. orientale*, Chiovenda in Ann. Ist. Bot. Roma, vii., 65, non Rich.

Golis Range, *Drake-Brockman*, 151; without precise locality, *Lort-Phillips*, *Brockman*, 50; near Hargeisa, *Riva*, 52. "Samples, found at Burao, near the river bed and at Upper Sheikh. A good grass, but not plentiful. Height about 2 feet."—*Appleton*.

DISTR. From Tripoli to tropical Arabia and Socotra.

VERN. *Arabjeb* (Drake-Brockman). See the preceding species. Chiovenda also describes a var. *altissima* from specimens collected by Riva near Hargeisa, but the differences are so slight as to suggest merely a case of individual variation.

P. villosum, *R. Br.*; Engl. Veget. Somaliland, in Sitz. Ber. Preuss. Ak. Wiss. Berlin (1904), 56 (reprint).

Jebel Serut near Maid, 1,800 m., *Hildebrandt*, 1480.

DISTR. Abyssinia, tropical Arabia

P. pachycladum, *Chiovenda*, l.c. vi., 167.

Habr Awal country, *Robecchi*.

VERN. *Garaw* (Robecchi).

DISTR. Endemic.

Tricholaena rosea, *Nees*.

Golis Range, in dry water-courses, *Lort-Phillips*, *Drake-Brockman*, 116.

DISTR. In several varieties all over tropical Africa, South Africa and tropical Arabia. The Somali specimens correspond to the form named *T. grandiflora* by Hochstetter.

T. Teneriffae, *Parl.*; Hook. f., Fl. Brit. Ind. vii., 65.

Golis Range, *Lort-Phillips*, *Drake-Brockman*, 115.

DISTR. From the Canaries to the Panjab, and southward to Usambara.

Anthephora Hochstetteri, *Nees*.

Without precise locality, *Drake-Brockman*, 47.

VERN. *Hamashleh* (Drake-Brockman).

DISTR. To Abyssinia and Nubia.

Tristachya Bricchettiana, *Chiovenda*, l.c. v., 163, t. 14.

Between Gildessa and Zeila, *Robecchi*.

DISTR. Endemic.

T. barbata, *Nees*; Hook. f., l.c. 272.

Golis Range, *Drake-Brockman*, 250.

DISTR. To Nubia and the Panjab.

Polypogon monspeliensis, *Desf.*; Hook, f., l.c. 245; Duthie, Fodd. Grass. N. Ind. 50.—Syn. *P. fugax*, Duthie, Fodd. Grass. N. Ind. 51.

Without precise locality, *Lort-Phillips*.

DISTR. Throughout the Mediterranean region and continental India, southwards to East Africa. Introduced into most other warm parts of the world.

Phragmites communis, *Trin.*; Hook. f., l.c. 303; Duthie, Fodd. Grass. N. Ind. 60.

Without precise locality, *Lort-Phillips*.

DISTR. Almost cosmopolitan.

The specimen (barren) probably represents var. *isiacus*, which Dr. Riva collected on the Dana River in Abyssinian Somaliland (Chiovenda, l.c. vii., 77).

Aristida adscensionis, *L.*; Hook., Fl. Brit. Ind. vii., 225.—Syn. *A. adscensionis*, var. *abyssinica*, Engl., Veget. Somaliland, in Sitz. Ber. Preuss. Ak. Wiss, 1904, 50 (reprint). *A. depressa*, Retz; Duthie, Fodd. Grass. N. Ind. 47. *A. Hystrix*, Duthie, Ill. t. 30, non Linn.

Daraas, *Cole*. Ahl Mountains, *Hildebrandt* (according to Engler).

—— var. **aethiopica**, *Stapf* in Hook. f., l.c. 226.

Golis Range, *Drake-Brockman*, 145; without precise locality, *Lort-Phillips*. "Grows freely at Bohotle, Burao and Upper Sheikh on good ground; the stem is 1½–2 ft. long. It is considered a good feeding grass."—*Appleton*.

DISTR. (of the species). All warm countries.

A. redacta, *Stapf*; Hook. f., l.c. 227.

Maritime plain of Berbera, 150 m., *Cole*.

DISTR. Through South Persia to Bengal and Central India.

A. somalensis, *Stapf*, sp. nov.; affinis *A. vestitae*, Thunb., sed dimensionibus glumarum et arista haud cum valva articulata distincta.

Perennial, densely caespitose, light green. *Culms* up to 1 m. long, erect, simple, about 4-noded, with the uppermost internode finally by far the longest, wiry, glabrous, smooth. *Leaf-sheaths* tight, smooth, scarcely striate, glabrous, the lowest bearded at the mouth; ligule a fringe of short hairs; blade convolute-setaceous, up to 20 cm. long, up to 2·5 mm. broad when expanded, rigid, curved, glabrous, smooth below, scaberulous above and along the margins. *Panicle* erect, effuse or slightly contracted, 20–30 cm. long, up to 15 cm. wide; rhachis strict; branches 2–3-nate, up to 15 cm. long, the longest undivided for 5–6 cm., then sparingly

branched; branchlets flexuose or straight, filiform, like the branches scabrid; pedicels 1–10 mm. long. *Spikelets* yellowish or brownish, 12–14 mm. long. *Glumes* scarious, rounded at the back, linear-acute, with a long fine point, 1-nerved, the lower lanceolate, 9–12 mm. long, flattened out 3 mm. broad, upper linear, 15–18 mm. long, 2 mm. wide. *Valve* linear produced into a twisted scaberulous beak, 16–18 mm. long (of which 8–10 mm. go to the beak), smooth below the beak; callus 1 mm. long; awn continuous with the valve, bristles divaricate, the lateral 25–30 mm., the middle 35–40 mm. long. *Palea* elliptic, subtruncate, 15 mm. long. *Lodicules* obovate-oblong, 2 mm. long, finely nerved. *Anthers* purple, 6 mm. long.

Golis Range, *Drake-Brockman*, 10, 124, 127; without precise locality, *Lort-Phillips*.

VERN. *Saddeh Eli* (Drake-Brockman).

A. Kelleri, *Hack.* in Mem. Herb. Boiss, No. 20, p. 8; Engl. Veget. Somaliland in Sitz. Ber. Preuss. Ak. Wiss., 1904, 41 (reprint).

Haud, *Thomson*, also *Riva* according to Engler.

DISTR. Somaliland (Ogaden, *Keller*).

A. papposa, *Trin. & Rupr.*

Without precise locality, *Drake-Brockman*, 37, 39; Haud, *Thomson*, 92 a.

VERN. *Mardweidleh* (Drake-Brockman).

DISTR. From Abyssinia through the Sudan to the west coast and the Cape Verd Islands; also in Gaboon and Loanda.

A. hirtigluma, *Steud.*

Golis Range, *Drake-Brockman*, 149.

DISTR. From Abyssinia and Egypt to the Panjab.

A. plumosa, *L.*, var. **brachypoda**, *Trin.*—Syn. *A. brachypoda*, Tausch.; Engl. l.c. 50. For *A. plumosa*, see Hook. f., l.c. 228; Duthie, Fodd. Grass. N. Ind., 47.

Ahl Mountains, *Hildebrandt*.

DISTR. (of the species). From North Africa and Nubia to Western Tibet.

Perotis latifolia, *Ait.*; Hook. f., Fl. Br. Ind. vii., 98; Duthie, Fodd. Grass. N. Ind., 22.

Without precise locality, *Lort-Phillips*.

DISTR. Throughout Tropical Africa and Asia; also in South Africa.

Tragus racemosus, *All.*; Hook. f., l.c. vii., 97; Duthie, Fodd. Grass. N. Ind., 22, Ill. t. 14.

Golis Range, *Drake-Brockman*, 163.

DISTR. Most warm countries.

T. paucispina, *Hack.*

Without precise locality, *Lort-Phillips*.

DISTR. Nubia, Sudan.

Latipes senegalensis, *Kunth.*, Hook. f., l.c. 97; Duthie, Fodd. Grass. N. Ind., 22.

Golis Range, *Drake-Brockman*, 93, 108, 206. "Found near water at Burao, but in very small quantities."—*Appleton.*

Sporobolus variegatus, *Stapf*, sp. nov.; affinis *S. festivo*, Hochst., sed spiculis paulo majoribus, glumis tenuissimis angustis, valva tenuiter hyalina obtusissima distincta.

Culms very slender, glabrous, upper 3 internodes shortly exserted from the sheaths. *Leaf-sheaths* (only the 2 uppermost known) very tight, smooth, very finely striate; *ligule* a fringe of very short hairs; *blades* linear, long, tapering to a fine point, up to 2 cm. long, up to 2 mm. wide (flattened out), glaucous or pale green, with scattered very fine tubercle-based hairs in the lower part. *Panicle* ovoid, lax, 6–9 cm. long, about 3 cm. wide; rhachis very slender with long scattered very fine hairs; branches paired or the lowest 3-nate, the upper frequently solitary, capilliform, 2·5–1·5 cm. long, the lowest divided from the base, the others from 3–6 mm. above it, ultimately like the secondary branchlets almost divaricate; pedicels extremely fine, up to 5 mm. long. *Spikelets* lanceolate, 1·8–2 mm. long, variegated. *Glumes* linear to linear-oblong, subacute or obtuse, very narrow, the lower almost 1 mm. long, the upper slightly longer, very delicate, white, hyaline, nerveless. *Valve* elliptic-oblong, very obtuse, almost 2 mm. long, hyaline, obscurely 1-nerved, purple at the base, otherwise almost colourless or white. *Palea* as long as the valve; keels smooth. *Anthers* over 1 mm. long, purple.

"Found occasionally in small quantities between Bohotle and Upper Sheikh. A poor feed."—*Appleton.*

S. fruticulosus, *Stapf*, sp. nov.; *S. Ghikae*, Schwf. & Volck., affinis esse videtur, sed laminis glabris, vaginis eciliatis, paniculae ramis fere semper solitariis, plumis longioribus distincta; a *S. somalensi*, Chiov., culmis ramosissimis, paniculis brevibus, pedicellis brevissimis, glumis inaequalibus undique asperulis differt.

Culms much branched, hard, slender, 10–15 cm. high, suffrutescent, quite glabrous. *Leaf-sheaths* tight, glabrous, smooth; those of the persistent parts of the culms and of the innovation-buds very firm and persistent; *ligule* a fringe of short hairs; *blades* tapering almost from the base to a long, very fine point, 1–3 cm. long, 1–2 mm. broad at the base, pale green, minutely asperulous above, sometimes with a few extremely fine long hairs from close above the ligule, otherwise glabrous. *Panicle* oblong to ovoid, 3–4 cm. long, ultimately open and up to 2·5 cm. wide, rigid; branches filiform, usually solitary, the longest somewhat over 1 cm. long, when mature spreading almost at right angles, divided from 2–3 mm. above the base, rough; pedicels in dense clusters at the ends of the branches and branchlets, very short. *Spikelets* lanceolate, whitish or purple at the base, 1·5–1·75 mm. long. *Glumes* lanceolate to ovate-lanceolate, acute or subobtuse, minutely asperulous all over, lower 0·75–1 mm. long, nerveless, upper 1–1·4 mm. long, faintly 1-nerved. *Valve* oblong, subobtuse, 1 to

sub-3-nerved, minutely asperulous, at least in the upper part. *Palea* as long as the valve. *Anthers* purple.

"Found in very small quantities between Burao and Upper Sheikh."—*Appleton.*

The specimen quoted above is in the state of flowering. There are, however, others in the stubble condition, but with some over-mature panicles, against which Col. Appleton wrote the note referred to under *Andropogon cyrtocladus* (see p. 210).

S. festivus, *Hochst. ex A. Rich.*; Engl. Veget. Somaliland in Sitz. Ber. Preuss. Ak. Wiss., 1904, 55 (reprint).

Without precise locality, *Lort-Phillips.* "Found between Garraro and Burao. A poor feed."—*Appleton.* "From Garraro, also found between Burao and Upper Sheikh. A very poor grass."—*Appleton.* Ahl Mountains, 1300 m., *Hildebrandt.*

DISTR. In several varieties throughout Tropical and South Africa.

S. longibrachiatus, *Stapf*, sp. nov.; affinis *S. pallido*, Nees, sed paniculae ramis longioribus, infimis rhachim mediam excedentibus, proportione glumarum valvaeque et vagina etiam ad margines glabra distincta.

Upper leaf-sheaths glabrous, smooth, finely striate, tight, up to 15 cm. long, *ligule* a narrow, membranous, ciliolate rim; blades linear, long attenuate to a fine point, up to 2 mm. wide at the base, pale green, or glaucous above, smooth. *Panicle* shortly exserted from the uppermost sheath, ovoid when expanded, lax, 14–18 cm. long, 12–15 cm. wide, rhachis very slender, smooth; branches filiform, the lower 10–12 cm., middle ones 6–7 cm. long, undivided for 1–2·5 cm., then remotely branched, lower branchlets 2–3 cm. long with distant short divisions, which are again divided, the ultimate ramifications bearing 3 or 4 approximate more or less secund spikelets; pedicels like the preceding divisions of the panicle slightly scaberulous, the lateral very short. *Spikelets* lanceolate, 1·7–1·8 mm. long, pale green or tinged with purple, slightly asperulous. *Glumes* hyaline, oblong, subacute or the tips minutely denticulate, lower 0·7–0·8 mm. long, nerveless, upper 1·2–1·4 mm. long, faintly 1-nerved. *Valve* oblong, subacute, 1-nerved. *Palea* slightly shorter than the valve.

"Grows freely at Bohotle, Burao and Upper Sheikh. Height from 2 to 3 feet. Considered a poor feeding grass."—*Appleton.*

S. marginatus, *Hochst. ex A. Rich.*

Without precise locality, *Lort-Phillips.*—"Grows in clumps near the river-bed at Burao and occasionally at Upper Sheikh."—*Appleton.*

DIST. From Abyssinia through East Africa to Nyasaland.

S. spicatus, *Kunth*; Hook. f., Fl. Brit. Ind. vii., 250.

"Grows near water round Upper Sheikh, Lower Sheikh and Bihendula, much resembling 'hariali' in its manner of growth. An excellent feed."—*Appleton.*

DISTR. From the Cape Verd Islands to India.

S. robustus, *Kunth.*

Without precise locality, *Drake-Brockman*, 30, 32.

VERN. *Werris* (Drake-Brockman).

DISTR. To Tropical Arabia and through the Sudan to West Africa.

S. Brockmanii, *Stapf*, sp. nov.; affinis *S. indico*, R. Br., sed foliis brevibus planis, spiculis paulo longioribus, glumis aequalibus longioribus distincta.

A densely tufted, perennial grass. *Culms* 25–40 cm. high, erect, slender, smooth, glabrous, about 3-noded, internodes enclosed with the exception of the uppermost. *Leaf-sheaths* tight, finely striate, glabrous or finely hairy along the outer edge and near the mouth, those of the barren shoots 2–3 cm. long; *ligule* a narrow, ciliate, membranous rim; *blade* tapering almost from the base to a long fine point, spreading, 5–7 cm. long, 2·5–3·5 mm. wide at the base, somewhat firm, pale green or glaucous, smooth, glabrous or with scattered, tubercle-based hairs, particularly along the thickened margin. *Panicle* very narrow, contracted, interrupted, 7–10 cm. long, about 4 mm. wide; rhachis stiff, smooth; branches solitary, often shorter than the internode (particularly the lower), adpressed to the rhachis, 2–0·5 cm. long, divided from the base or almost so, much contracted; branchlets short, asperulous; lateral pedicels short to very short. *Spikelets* lanceolate to oblong, 2·25–2·4 mm. long, silvery grey; close together. *Glumes* equal or nearly so, lanceolate to lanceolate oblong, 1·6–1·8 mm. long, hyaline, white, smooth, the lower nerveless, the upper faintly 1-nerved, the tips often minutely denticulate. *Valve* oblong, subacute, very thin, grey below, white towards the tip, finely 1-nerved. *Palea* as long as the valve. *Anthers* yellow, slightly over 1 mm. long.

Golis Range, *Drake-Brockman*, 11.

VERN. *Garra gorro* (Drake-Brockman).

S. capensis var. *altissimus*, Chiovenda in Ann. Ist. Bot. Roma, vol. vi., p. 168, tab. ii., is very likely this plant. It differs from *S. capensis*, Kunth (=*S. indicus*, R. Br.), as stated above in the short leaves which spread usually at a right angle and in the longer, narrower and equal glumes of the slightly larger spikelets. Chiovenda's plant was collected by Robecchi in the country of the Habr Awal. According to Robecchi its vernacular is "Saddaho," a name quoted by Brockman for *Dactyloctenium glaucophyllum*, Courb. (spelt "Saddehho").

Eragrostis papposa, *Steud.*; Stapf in Hook. f., Fl. Brit. Ind. vii. 322.

Hammar, *Cole*. Golis Range, *Drake-Brockman*, 89. Waggar Mountains, Gedais, in rocky river-bed, 1,600 m., *Lort-Phillips*. Without precise locality, *Drake-Brockman*, 36. "Found in the valleys between Bohotle and Upper Sheikh. A good feed." —*Appleton*.

DISTR. To North Africa and the Panjab, southwards to East Africa.

E. megastachya, *Link*; Duthie, Fodd. Grass. N. Ind. 63, Ill. t. 75.—Syn., *E. major*, Host; Stapf, l.c. 320.

Golis Range, *Drake-Brockman*, 208. Without precise locality, *Lort-Phillips*, *Drake-Brockman*, 5.

VERN. *Harfo* (Drake-Brockman.)

DISTR. All over Africa and India. Introduced as a weed into many countries.

E. Barrelieri, *Dav.*; Chiovenda in Ann. Ist. Bot. Roma, vi., 173.

VERN. *Harfo* (Robecchi). See the preceding species.

DISTR. Mediterranean Region, Nubia, tropical Arabia.

E. aspera, *Jacq.*; Stapf, l.c. 314.

Mirsa Ridge, Gollen, *Cole*. Without precise locality, *Lort-Phillips*.

DISTR. Sporadically throughout tropical and South Africa; occasionally in India (introduced).

E. ciliaris, *Link*; Stapf, l.c., Duthie. Fodd. Grass, N. Ind. 62, Ill. t. 38; Chiovenda, l.c. 172.

Ahl Mountains, 1,000 m., *Hildebrandt*, 875.

Between Hargeisa and Berbera, *Robecchi*.

DISTR. Throughout the tropics.

E. tenella, *Roem. & Schult.*, var. **plumosa**, *Stapf*; Stapf, l.c. 315.—Syn. *E. plumosa*, Link; Duthie, Fodd. Grass. N. Ind. 64, Ill. t. 77.

Ahl Mountains, Damalle, 1,000 m., *Hildebrandt*, 877.

DISTR. From Abyssinia to India.

Eragrostis plumosa, Link, corresponds to the original of Linnaeus' *Poa tenella*, the basis of *E. tenella*, Roem. & Schult., and my var. *plumosa* is therefore really what might be called typical *E. tenella*.

Harpachne Schimperi, *Hochst. ex A. Rich.*

Golis Range, *Drake-Brockman*, 181.

DISTR. Abyssinia to Usambara.

Cynodon Dactylon, *Pers*; Hook. f., Fl. Brit. Ind. vii., 288; Duthie, Fodd. Grass. N. Ind. 52, Ill. 33.—Syn. *Dactylon officinale*, Vill.; Chiovenda in Ann. Ist. Bot. Roma, vi., 169.

Habr Awal country, *Robecchi*; Golis Range, *Drake-Brockman*, 158, 159. "Grows freely at Bohotle, Burao, and Upper Sheikh. Height about 3 feet. A good feeding grass."—*Appleton*.

DISTR. Cosmopolitan.

Enteropogon somalensis, *Chiovenda*, lc. vi., 170, t. 16.

Habr Awal country, *Robecchi*.

VERN. *Harrar* or *Harar* (Robecchi).

DISTR. Endemic.

E. Ruspolianum, *Chiovenda*, l.c. vii., 72, t. III., fig. iii.

Without precise locality, *Drake-Brockman*, 19.

VERN. *Ausad* (Drake-Brockman).

DISTR. Somaliland (Ogaden, *Riva*, 303).

E. macrostachyum, *Munro*; Chiovenda, l.c. vi., 170, t. xvii.

Habr Awal country, *Robecchi*; Golis Range, *Drake-Brockman*.

VERN. *Askorof* (Robecchi).

DISTR. From Arabia and Abyssinia to British East Africa.

Chloris somalensis, *Rendle* in Journ. Bot., 1899, 66.

Waggar Mountains, *Lort-Phillips*.

DISTR. Endemic.

C. tenella, *Roxb.*; Hook. f., Fl. Brit. Ind. vii., 290; Duthie, Fodd. Grass. N. India, 54, Ill. t. 56.

"Grows plentifully in the valleys round Upper Sheikh where it is cut and brought in mixed with other grasses. Usual length 2–2½ feet. A good feed."—*Appleton*.

DISTR. Abyssinia to India.

C. myriostachya, *Hochst.*

"Grows in small quantities near the water supply at Upper Sheikh."—*Appleton*.

DISTR. From Abyssinia and Arabia to Zanzibar.

Tetrapogon villosus, *Desf.*; Duthie, Fodd. Grass. N. Ind. 55, Ill. t. 68; Chiovenda in Ann. Ist. Bot. Roma, vii., 74; Engl., Veget. Somaliland in Sitz. Ber. Preuss. Ak. Wiss., 1904, 41 (reprint).—Syn. *Chloris villosa*, Pers.; Hook. f., l.c. 291.

Golis Range, in a deep rocky defile, *Lort-Phillips*. Without precise locality, *Drake-Brockman*, 1§. Haud (according to Engler). "A free grower in the valleys round Upper Sheikh, where it forms about a third of the grass supply brought in. It grows to 3 feet high and is highly valued as a forage. Found also in smaller quantities round Bohotle and Burao."—*Appleton*.

VERN. *Iya Makarai* (Drake-Brockman).

DISTR. From the Canaries to India.

According to Riva (Chiovenda, l.c.) this forms carpets locally in grassy places in the Ogaden Desert.

T. spathaceus, *Hack.*; Engl. l.c.

Haud (according to Engler). "Found in the rocky ground between Lower Sheikh and Bihendula, in very small quantities. Height 6 to 8 inches. Of no value."—*Appleton*.

DISTR. From the Cape Verd Islands to Tropical Arabia.

Dactyloctenium glaucophyllum, *Courb.*; Chiovenda, l.c. vi., 172, t. xviii.—*Eleusine aristata*, Hook. f., Fl. Brit. Ind. vii., 296, an Ehrenb.? *E. scindica*, Boiss.; Duthie, Fodd. Grass. N. Ind., 58, Ill. t. 36.

Habr Awal country, *Robecchi*. Without precise locality, *Drake-Brockman*, 8, *Lort-Phillips*. "This grass grows very rapidly and is found in great quantities in the Haud and occasionally in

British Somaliland. Cattle and sheep eat it greedily ; but it is dangerous for horses, causing intense irritation of the bladder and kidneys if eaten in large quantities."—*Appleton.*

VERN. *Jaddoho*, *Dojo* (Robecchi) ; *Saddeh ho* (Drake-Brockman).

DISTR. Nubia to the Panjab.

This is the plant which was described by Boissier as *D. scindicum*, from specimens collected by Stocks in the Indus Delta, and it is probably also identical with the grass enumerated by Chiovenda (l.c. vii., 6) as *D. aristatum*, and described as forming turf in the Ogaden country. Whether it is the original *D. aristatum* of Link, Hort. Berol. i. 59, is doubtful, and can only be decided by comparison with Link's original. Of the specimens distributed by Schweinfurth as *D. aristatum*, and enumerated as such in Bull. Herb. Boiss. ii., App. ii., 35, the Shugra plant (No. 71) is *D. glaucophyllum*, while the Arkiko specimen (No. 158) belongs to another species, evidently an annual with flaccid leaves and very small anthers (0·4–0·5 mm.). We have this other species also from the Nubian Coast (at about 21° N. lat., *Bent*) ; the Dalak Archipelago (*Steudner*, 1050) ; and Socotra (*Balfour*, 42 and 69). Steudner's plant was also distributed as *D. aristatum*, and in any case it agrees well with Link's description.

Eleusine floccifolia, *Spreng.*

Without precise locality, *Drake-Brockman*, 23.

VERN. *Garrgorr* (Drake-Brockman). *See* "Garra gorro" for *Sporobolus Brockmanii.*

DISTR. Tropical Arabia to Abyssinia.

Leptochloa obtusiflora, *Hochst.* ; Hook. f., l.c.

"Principally grows in the valleys above Upper Sheikh from whence it is cut and brought in. It grows to about 3 feet and is an excellent feed."—*Appleton.* Without precise locality, *Lort-Phillips.*

DISTR. Abyssinia, tropical Arabia ; also in India (introduced ?).

L. Appletonii, *Stapf*, sp. nov. ; affinis *L. obtusiflorae*, Hochst., sed spiculis majoribus, valvis basin versus demum induratis et hic aequaliter pubescentibus diversa.

Perennial, densely tufted, *Culms* slender, geniculate at the base, 15–25 cm. high, 3–1-noded, internodes exserted, glabrous, smooth, the uppermost by far the longest. *Leaves* glaucous ; sheaths glabrous, smooth, the lower compressed, their bases persistent ; ligule short, hyaline ; blades convolute in the bud, at length flat, linear, long attenuated into an acute point, those of the barren shoots up to 10 cm. by 2 mm., of the culms usually much shorter and spreading, with long fine hairs near the base, otherwise glabrous, smooth, midrib broad and white on the upper side, primary nerves 5–7, prominent above, with 4–6 finer ones alternating with them. *Racemes* spiciform, compact, subdistichous, seated along a slender common axis which is straight or slightly flexuous, angular, smooth or almost so, and 5–20 cm. long ; racemes up to 7, subsessile, up to 10 cm. by 6 mm., with up to 20 spikelets ; rhachis slightly wavy, asperulous ; pedicels extremely short, but

distinct. *Spikelets* laterally compressed, oblong, obtuse, up to 7 mm. by 2 mm., whitish green, or slightly tinged with purple; florets up to 12, very close; rhachilla-joints clavate, at length often very much thickened upwards, glabrous or minutely hairy. *Glumes* subequal, ovate, subacute, up to 3 mm. long, subscarious, 1-nerved, persistent. *Valves* imbricate, obliquely ovate in side view, obtuse, entire, muticous, 2·5–3 mm. long, membranous and whitish when young excepting the sometimes slightly purplish upper half, at length indurated and yellowish below the middle, silky pubescent all over the back in the hardening part, hairs clavate-tipped; nerves green, the lateral subpercurrent. *Pales* much shorter than the valves, membranous, 2-keeled, folded backwards, rotundate-elliptic when flattened; flaps very narrow; keels minutely serrate. *Lodicules* broad-cuneate. *Anthers* 0·75 mm. long. *Ovary* glabrous; styles long, with the top of the ovary produced between them; stigmas short, laterally exserted. *Grain* tightly enclosed by the rigid valve and pale and deciduous with them, elliptic-oblong, dorsally much compressed, concave-convex (when dry), 1 mm. long, yellowish; embryo elliptic in outline, almost half as long as the grain; hilum punctiform.

Golis Range, *Brockman*, 99, 101, 147. "Grows freely in the valleys round Upper Sheikh and sparingly at Burao. One of the principal grasses cut and brought in. An excellent feed; grows to 3 feet."—*Appleton.*

Enneapogon mollis, *Lehm.*

Without precise locality, *Drake-Brockman*, 41.

VERN. *Aggan* (Drake-Brockman).

DISTR. To the Sudan, Angola and South Africa.

E. elegans, *Stapf.*—Syn. *Pappophorum elegans*, Nees; Hook. f., Fl. Brit. Ind. vii., 301.

Golis Range, *Drake-Brockman*, 175, 180. Without precise locality, *Lort-Phillips*. "A good feeding grass found in small quantities round Bohotle and Burao, but in large quantities in a valley above Upper Sheikh."—*Appleton*. In the Haud, *Thomson*, 92 b.

DISTR. To Abyssinia, the Deccan Peninsula and Burma.

Aeluropus repens, *Parl.*—Syn. *A. villosus*, Trin. ex C. A. Mey; Hook. f., l.c. 334.

On the shore at Berbera, above high-water mark, *Lort-Phillips*, *Perry*.

I add here descriptions of two new grasses—one collected by the late Theodore Bent in Socotra and closely allied to *A. cyrtocladus* (p. 209), the other discovered in Italian Somaliland by Col. Appleton and a near ally of a peculiar Socotran species:—

Andropogon (§ **Arthrolophis**) **Bentii**, *Stapf*, sp. nov.; affinis *A. Kelleri*, Hack., et *A. cyrtoclado*, Stapf, ab utroque racemis brevius pilosis, villis spiculis minime occultantibus, spiculae sessilis valva inferiore (neutra) 3-nervi, superiore eciliata, paleis eciliatis vel subeciliatis, ab *A. cyrtoclado* praeterea racemis solitariis spiculis minoribus differt.

Suffrutescent, many-noded; branches spreading, recurved or ascending, glabrous, terete, hard; internodes of the flowering branches more or less exserted, not glaucous, those of the main culms up to 2·5 cm., of the branches 1–1·5 cm. long. *Leaves* glabrous, sheaths persistent, terete, tight, firm, smooth, finely striate in the upper part; ligule a minute, membranous rim; blades attenuated from the slightly rounded base (1–1·2 mm. wide) into a fine point 1–2 cm. long, subglaucous, firm, smooth, primary nerves about 5, alternating with much finer solitary or paired secondary ones. *Peduncles* slender, up to 3 cm. long, shortly exserted from the almost bladeless uppermost sheath, with a tuft of hairs at the apex. *Racemes* paired, solitary one sessile, the other on a slender peduncle (3–5 mm. long), subparallel, silky, 1–2 cm. long; joints 3–5, slender, slightly wider upwards, 3 mm. long, hairy along the edges only, hairs white, lower very short, uppermost as long as the joint; pedicels like the joints. *Sessile spikelets* lanceolate, acute, 5 mm. long, pale; glume glabrous, lower papery, very smooth and shining on the back, shallowly channelled along the middle, keels scaberulous upwards, rounded and smooth below, each with 3 fine, close nerves; upper glume as long as the lower, boat-shaped, acute, faintly 3-nerved, ciliate; *lower valve* lanceolate, acute, hyaline, very faintly 3-nerved, ciliate; *upper valve* lanceolate, deeply bifid, 3·5 mm. long, 1-nerved, awn about 8 mm. long, very fine, kneed at or below the middle, glabrous; palea oblong, truncate, 0·75 mm. long; anthers 2 mm. long. *Pedicelled spikelets* barren or male, lanceolate, acute, 5 mm. long, glabrous; *lower glume* 7–9-nerved, upper 3-nerved, subhyaline; *valves* hyaline, 1-nerved, 3 mm. long.

SOCOTRA.—*Bent.*

Panicum (§ **Eupanicum**) **Appletonii**, *Stapf*, sp. nov.; affinis *P. rigido*, Balf., Socotrensi, sed foliis glabris, rigidioribus, paniculā parvā brevissimā, spiculis submajoribus, glumis valvisque firmioribus nervis minus distinctis necnon toto habitu multo robustiore differt.

Perennial, quite glabrous; rhizome short, emitting numerous, long, fibrilliform roots and tufts of erect shoots and creeping or ascending stolons. *Shoots* and *stolons* branching (often copiously) when reaching the surface, forming dense, intricate tufts from a few to 10 cm. high, or some of them much stouter, elongated, prostrate, sending out short branches from the nodes; underground parts covered with persistent sheaths, overground branches fascicled, slender, many-noded, closely sheathed. *Sheaths* terete, smooth, those of the underground parts or prostrate branches up to 3·5 cm. long and the lowest bladeless, of the short branches above the ground under 1 cm. long and slender; *ligule* a fringe of minute stiff hairs; *blades* firm, linear-lanceolate to sublinear, tapering almost from the base, those of the long shoots up to 5 cm. by 4 mm. (when flattened out), of the short shoots from less than 1 to 3 cm. long, tightly involute, needle-shaped, stiff, spreading, crowded, all rather blunt, finely striate. *Panicle* scarcely exceeding the uppermost leaves, 1 cm. long; branches finely filiform, rigid, up to 7 mm. long; pedicels very short to 2 mm. long, tips slightly thickened. *Spikelets* ovoid, subacute, almost 2 mm. long. *Glumes* broad-ovate, subobtuse, lower almost

half as long as the spikelet, 5-nerved, upper as long as the spikelet, 5-nerved. *Lower floret* male ; valve resembling the upper glume, palea almost as long as the valve. *Upper floret* hermaphrodite, 1·5 mm. long, sub-obtuse, valve and palea greenish-brown, shining, the valve faintly 5-nerved.

ITALIAN SOMALILAND : near Obbia, in sand, *Appleton.*

HINTS FOR THE COLLECTION OF GRASSES.

The following lines are intended for the traveller or resident who, without being a professional botanist, wishes to contribute to the botanical exploration of the country he travels or lives in. In a general way the conditions for collecting grasses are the same as for collecting other flowering plants, except that the merely technical part of the work is much simpler than in most other families ; there are, however, certain points which will have to be considered to make the collection as useful as possible.

Two principal objects offer themselves to the collector ; firstly, to gather as many different species as possible with a view, as it were, to a contribution towards a census of the flora of the district he is exploring ; and, secondly, to collect information which cannot be got otherwise than in the field, that is, information regarding distribution, share in the composition of the vegetation (frequency, scattered or social occurrence, association with other plants), physiological peculiarities (such as duration, period of sprouting, flowering, fruiting, and resting, seed dispersal), dependence on external conditions (soil, altitude, water-supply, light, shade, temperature), and the place they occupy in the economy of the animal kingdom, and of man especially (usefulness or obnoxiousness). Both objects are intimately connected. It is obvious that in the end no systematic knowledge of the character indicated under the second head is possible without our being able to connect our observations with the names of the plants. Any information of that kind, particularly if coming from a collector or observer who is not a professional botanist, will therefore have to be accompanied by specimens sufficiently complete to allow their determination by the specialist. In so far the requirements will be the same as in the case of mere specimen collecting. The latter has been the aim of most of the earlier collectors and still satisfies many of the recent. This implies no derogation of the value of their work. In fact without it we should have no botany ; but it does not exhaust botany or the possibilities which are within the reach even of the untrained collector. A complete set of specimens representing all the species growing in a given area, as for instance British Somaliland, would indeed be a great achievement. In itself it would be a mine of wealth for the taxonomist, morphologist and plant geographer, but after all it would be dead material. And so closely interwoven, in the light of modern science, are the problems of those doctrines with the life phenomena of the plants, that many of them would have to remain unsolved or be misinterpreted without the addition of field observation. Science is slowly adjusting itself to these

conditions by admitting even distant regions within the normal working sphere of the professional naturalist and linking them up with the old centres of research. This is the meaning of the establishment of botanical laboratories in the tropics, of enrolling the trained specialist for field work abroad, and also of initiating the home worker into the conditions of foreign vegetations by travel, the best of all object-lessons. When this has been generally accepted and has become an essential part of the organisation of our research work, a new era will also have set in for the botanical exploration of those immense districts which so far have only been skimmed. At present, however, we stand barely on the threshold of that era, and we must be thankful for any outside help we can get, however casual it may be. The shelves of our national herbaria and the pages of our colonial floras testify abundantly to the advantages which have accrued to our science from that side. So far they have been somewhat one-sided and too much in the direction of mere specimen collecting; but there is no reason why, with some guidance, our non-professional contributors should not avail themselves to the full extent of their opportunities and supply us with information which would often increase the value of their specimens, and, one might almost say, put life into them. The hints given here are conceived in the spirit of those principles and adapted to the limits within which the untrained collector may expect to do useful work, and apply at the same time more especially to the collecting of grasses.

1. Only complete specimens allowing reliable identification should be collected. This excludes specimens without flowers or fruits. The determination of such is very often quite impossible, or, when feasible, it takes more time than can conscientiously be devoted to it. An exception should only be made in rare cases, as when the grass is a very prominent feature of the vegetation or of economic importance, and cannot be had in the flowering (or fruiting) state, as is, for instance, frequently the case with bamboos. Inflorescences without leaves or, in the case of tufted perennials, flowering culms without basal leaves or barren leaf-shoots are less objectionable, but are still incomplete and the former may even be unidentifiable.

2. In the case of small grasses up to 40 cm. (16 in.) high, the whole grass should as far as possible be preserved with enough of the underground portion to show its nature. Grasses higher than 40 cm. (16 in.), but below 1 m. (3 feet), may be doubled up to go on sheets 40 cm. (16 in.) long. Still taller grasses have to be cut up, but enough of the culms and leaves should be gathered to show their conditions at different levels, and of these, too, sections of the underground stems with barren shoots attached to them should be gathered. The latter in the young state with their sheaths are particularly important in the case of bamboos.

3. The specimens should, whenever possible, be laid in before the leaves begin to fade or dry up and the inflorescences, as is often the case, contract.

4. Almost any paper will do for drying grasses. It is not necessary and not even advantageous to change the sheets on or in which the specimens are lying, as the leaves are apt to curl up

when lifted off. It is sufficient to renew the empty paper between these sheets from time to time. How often this has to be done depends mainly on the moisture of the air, if not done over fire. On the whole, grasses dry quickly and without changing colour. They may from the beginning be subjected to considerable pressure.

5. Every specimen should be accompanied by a numbered label, the numbers running on through the consecutive collections. The label should contain the name of the collector, the name and general character (wood, bush, savanna, river banks &c.) of the locality, approximate altitude, date of collecting, average height, frequency, association, or any other peculiarity of the grass which can only be made out in the field.

6. If in unexplored countries there is not sufficient time for thorough collecting, attention should be paid in the first place to the grasses which are most striking on account of their frequency, their general appearance, or their economic importance. It is better to have them well represented than to have an indiscriminate set of scraps.

7. In fairly well explored districts, the commoner and most conspicuous grasses might be treated more superficially, although they should by no means be neglected, and an eye might be kept on them with respect to their variation and physiological and economic peculiarities (*see* p. 208). On the other hand, small or rare grasses or such as flower irregularly or in unusual seasons should be the principal object of the collector. The collector should, however, always keep in mind that many grasses require close comparison to distinguish them, and that it will therefore be safer for him to err on the side of duplicating his specimens than otherwise.

The opportunities of the collector, particularly the traveller who has in the first place other objects to pursue, will of course not always permit him to carry out to the full the recommendations laid down here; but the minimum to be insisted upon is the collecting of identifiable specimens (paragraphs 1 and 2) and proper localising. Without that his time will frequently be wasted.

XXXVI.—THE FLOWERING OF CULTIVATED BAMBOOS.

W. J. Bean.

The last two decades have witnessed a great increase in the popularity of hardy bamboos. It was not, indeed, until about 1891 that any general interest was taken in them by horticulturists in this country, although their merits had been appreciated by French cultivators for some years previously. The formation of the Bamboo Garden at Kew in the winter of 1891–2 not only marked the beginning of a more general cultivation of these plants in Britain, it helped largely to bring it about. It was the first, and still remains the most important, collection open to public

inspection. The publication by Mr. A. B. Freeman-Mitford (now Lord Redesdale) of his most useful and able work "The Bamboo Garden" * has also been the means of greatly popularising these plants in gardens, and diffusing a general knowledge of their characteristics and requirements.

But during the past few years the enthusiasm of cultivators of bamboos has had a serious setback. They have been concerned to see the flowering of their bamboos one after another, followed, as that phenomenon nearly always is, by the death or serious crippling and disfigurement of the plants. Only those who have witnessed it can appreciate the grievous transformation that takes place when a bamboo, hitherto embodying the very perfection of leafy grace and vegetative vigour, breaks into flower and, in a few months, becomes a bundle of dead, leafless sticks.

The reports of botanists and travellers, especially in the Eastern tropics, had acquainted us with the phenomena attending the flowering of bamboos in their natural state : the transformation of great areas of luxuriant bamboo forest into barren, and often (by the firing of the dead stems and leaves) blackened deserts. Under cultivation in Europe, too, bamboos had been known to flower at rare intervals. The well-known *Arundinaria japonica* (Bambusa Metaké), for instance, flowered in 1872 and 1874, and *Arundinaria Falconeri* flowered in 1876 ; in the latter case the flowering was followed by the death of all the plants. But the likelihood that the new hardy bamboos introduced so freely into cultivation 15 to 20 years ago would flower in their due time did not enter many people's minds. The event was too uncertain and too few people had seen the results for them to be disturbed by any thought of the fate that would overtake their bamboos when the time for flowering had come.

The experiences of the last few years have considerably increased our knowledge of the behaviour of bamboos flowering under cultivation, and it seems desirable that some record should be made embodying our knowledge so far as it goes. The species enumerated in the following notes are all, so far as we know, that have flowered under cultivation within the last thirty years. The list will enable future cultivators to form some estimate of the probable duration of the lives of their plants and to judge of their value too. For it seems that we shall have to regard bamboos in much the ame light as leasehold property. Other things being equal, a p ant recently raised from seed, with pretty nearly its full term of years to run, will obviously be of more value than another with the greater portion of its "lease" expired.

Arundinaria auricoma, Mitford.—Flowers were noticed on plants growing in the Bamboo Garden at Kew as long ago as 1898, and they have been seen every year since. It is only very few of the culms, however, that flower, and except that the flowering culms die, the plants are not affected.

A. falcata, Nees.—Flowered in the Temperate House at Kew in 1884 and about the same time in several other places. It had flowered previously in Europe during the years 1866–7.

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* London : Macmillan & Co., 1896.

A. falcata, var. *glomerata*.—This also grows in the Temperate House and flowers almost every year on a certain number of culms, but the plant as a whole does not suffer. According to Gamble this sporadic flowering is characteristic of the type in a wild state.

A. Falconeri, Gamble (A. nobilis, *Mitford*).—The first introduction of this species to Britain took place apparently in 1847. A quantity of seeds were sent that year to Kew from India by Mr. Madden, and from these no doubt most or all of the plants in Irish and Cornish gardens were derived. In the same year seeds were obtained by Van Houtte, and in 1848 young plants were offered for sale by him. Nearly all these plants flowered simultaneously in 1876 by which time the species was cultivated in most European countries and in the United States. The plants died but produced seeds freely and from them the present generation of plants was raised.

The flowering of *Arundinaria Falconeri*, however, like that of many other Bamboos, is not simultaneous in the sense that plants in various places, or even in the same place, flower during one summer. Lieut.-Colonel Prain has noted the same thing in the Bamboo forests of the East. Although the general flowering of a species may occur in one particular year, it is heralded by the flowering of a few forerunners the previous year and followed by that of laggards the next. The year 1876 was the great flowering year of *Arundinaria Falconeri* and our specimens show that plants flowered then at Kew, Mount Edgcumbe, and wild in Sikkim. But plants had flowered at Trentham in 1875, whilst others at Holland House did not flower until 1877.

We seem at the present time to be in the midst of another but more protracted flowering period. As long ago as March, 1903, Kew received flowering specimens from Mr. J. C. Hawkshaw's garden at Hollycombe, Liphook; in 1904 they were received from the late Hon. Charles Ellis of Frensham Hall, and in 1906 from Lord Lansdowne's garden at Derreen, Kenmare; but none of the plants at Kew have yet flowered generally.

It should be noted that *A. Falconeri* does not always flower over the entire plant at one time. Odd culms flowered at Kew during 1893 and 1894.

A. Hookeriana, Munro.—Flowered in the Temperate House at Kew in 1899 and bore seed. All the Kew plants died, but at Glasnevin, where it flowered at the same time, some died whilst others recovered.

A. intermedia, Munro.—Flowered in the Temperate House at the same time as the preceding, and died also.

A. japonica, Sieb. et Zucc. (Bambusa Metaké, *Sieb.*).—In Lady Dorothy Nevill's garden at Dangstein this well-known Bamboo flowered in 1874. The late Signor Fenzi also records its flowering at Florence in 1872 (Gard. Chron., 1872, p. 1228). Specimens in the Kew Herbarium show that it was flowering in Japan in 1877.

A. racemosa, Munro.—Flowered in the Temperate House at Kew in 1899.

A. Simoni, A. & C. Rivière.—As long ago as 1892, the first year of the Bamboo Garden at Kew, we noticed odd culms flowering on the plants of this species growing there. But excepting that the flowering culms died, the plants were in no way affected. Their general vigour and the number of young culms sent up were in no way diminished. They continued to flower in this way every year up to 1903, by which time we had almost come to regard *A. Simoni* as a perennial. In that year, however, the plants in the Temperate House flowered on every culm, and, after producing an abundance of seed, died. This species is, of course, quite hardy, and large clumps 18 feet high were growing at that time in the Bamboo Garden, but it was not until the two following years (1904–5) that these flowered on every culm. After that not a single trace of leaf-growth was ever visible and the plants were ultimately uprooted.

A. Simoni var. *variegata*, Hook. f.—This differs from typical *A. Simoni* only in having a proportion of its leaves striated with white. Often, so few leaves are marked, that the plants scarcely differ from ordinary *A. Simoni*. Yet, curiously enough, although every particle of the true *A. Simoni* has flowered, not one of the specimens of this variety has done so. It is figured in Bot. Mag. t. 7146 where it is said to have flowered in 1877, but whether the flowering was partial or complete cannot be inferred from the context. [Since the above was written I have seen a plant of this variety flowering in Messrs. Veitch's nursery at Coombe Wood. We may infer therefrom that the plants of *A. Simoni* var. *variegata* in this country are about to share the fate of the type. —W. J. B.]

A. Simoni var. *Chino*, Makino (A. Laydekeri, *Hook. f.*).—This is a dwarf Bamboo with mottled leaves, very distinct from the type. It flowered in the Bamboo Garden at Kew in 1896 all over the plant, and although every effort was made to save it (as it was the only one we had) it died the following year. According to a letter from Mr. A. B. Freeman-Mitford (now Lord Redesdale) dated Nov. 17, 1901, this Bamboo had flowered at Batsford during the four previous seasons and was none the worse. But this, I assume, was the partial flowering which has been alluded to as characteristic of *A. Simoni*.

Chusquea abietifolia, Griseb.—A striking example of simultaneous flowering is afforded by this West Indian Bamboo. Sir Daniel Morris records the phenomenon as seen by him in 1884–5, in Gard. Chron., Oct. 23, 1886, p. 524, where he observes that "when the seed was set, the stem began to die down and apparently every plant in the island [Jamaica] died, root and all." It is a curious fact that a plant growing in the Palm House at Kew flowered at exactly the same time and died also.

Phyllostachys aurea, A. & C. Rivière.—Flowered with Signor Fenzi at Florence in 1876, but so far as the British Isles are concerned we have but one record of its flowering. This was in Mr. S. T. Heard's garden at Rossdohan, Kerry, in 1905.

P. nigra, Munro.—Several reputed species of *Phyllostachys* have, as a consequence of their recent flowering, had to be reduced

to varieties of *P. nigra*. However much they may have differed from each other in leaf and stem characters, the bamboos here grouped under *P. nigra* have shown not the least difference in floral characters. In this respect they are absolutely identical with *P. nigra*. At Kew *P. nigra* itself has not yet flowered, although all the varieties here mentioned have done so. It has, however, flowered in other places. In 1900, it flowered with Mr. F. W. Moore at Glasnevin, Dublin ; in 1901, with the late Hon. Charles Ellis at Frensham Hall near Haslemere ; and, in 1902, with Lord Ventry at Burnham, co. Kerry.

P. nigra var. *Boryana* (P. Boryana, *Mitford*).—Flowered at Kew in 1904, and at Exeter the previous year. Of the original plant at Kew a small portion is still alive ; this may be from a piece of rhizome which had not flowered. At any rate the entire plant died with this exception.

P. nigra var. *Castillonis* (P. Castillonis, *Mitford*).—This beautiful bamboo, with its golden-yellow stems, is very different from the ordinary black-stemmed *P. nigra*. Yet when it flowered at Kew, in 1903 and 1904, it was found to be the same species.

P. nigra var. *fulva*, (P. fulva, *Mitford*).—Flowered at Kew in 1905.

P. nigra var. *Henonis* (P. Henonis, *Mitford*).—Flowered at Tilgate, Crawley, Sussex in 1898 ; at Menabilly in Cornwall, Regent's Park, and Rodway House near Bristol, in 1900 ; and since then in very many gardens. At Kew it flowered in the Temperate House in 1902 ; and in the open air from 1903 to 1905. None of the plants recovered and the collection has sustained no severer loss than that of this beautiful bamboo.

P. nigra var. *punctata*.—First flowered at Kew and at Abbotsbury in 1900. During the next few years other plants flowered at Kew and in numerous other gardens.

The following cultivated species have not yet flowered in this country, but it may be of interest to give the dates when they were last known to flower in a wild state.

Arundinaria aristata, Gamble.—Now cultivated in the Temperate House at Kew and by Mr. S. T. Heard at Rossdohan, Kerry. It flowered in Sikkim in 1895.

A. macrosperma, Michx.—This is the only hardy bamboo from the New World. It flowered in the S. United States between 1872 and 1878.

A. nitida, Mitford.—Mr. E. H. Wilson collected flowering specimens of a bamboo in Western Hupeh, China, June, 1900, which were subsequently identified as this species.

Some bamboos evidently go much longer than others without flowering. *Bambusa tessellata*, Munro, has been in cultivation for probably over sixty years, yet I have seen no record of its having flowered anywhere. It is the same with *Arundinaria Fortunei*, A. & C. Rivière, which has been in cultivation for nearly, or quite, fifty years.

There is, no doubt, a good deal yet to be learnt about the flowering of bamboos. We know, however, that they have two

methods of flowering—the partial or sporadic as contrasted with the complete and simultaneous. The partial flowering, as in the case of *Arundinaria Simoni*, is sometimes merely the beginning of the end, and culminates in the flowering of the entire plant and its death. Whether there are species that will continue to flower at intervals and never break into that general flowering which is always followed by the death of the individual plant, we do not yet know. But from what is noted above with regard to cultivated species, it would appear that the production of flowers is fatal to that part of the plant affected. If the whole plant flowers then the whole of it dies. Every one of the *Phyllostachys* that has flowered hitherto at Kew has sooner or later died, with the exception of the small portion of a plant of *P. nigra* var. *Boryana* noted. Seedlings have been raised from most of them, but as the parent plants have all proved to be varieties or forms of *P. nigra*, it is doubtful whether their progeny will reproduce their peculiar characters.

Mr. E. H. Wilson, the well-known collector of Chinese plants saw *Phyllostachys nigra* in flower in the Yang-tsze valley in May, 1903, and he says "I noted that only the flowering culms die" (Gard. Chron. Aug. 12, 1905, p. 125). It would be interesting to know whether the length of life in a bamboo would be altered by deferring the sowing of the seed. Judging by one's ordinary experience it would not; one would expect plants from the seed of *Arundinaria Falconeri*, sown in 1876, to reach the flowering state, other circumstances being equal, two years earlier than plants raised from similar seed kept until 1878. Yet when we consider the various accidents which even in a wild state would help to vary the time of germination, it would seem that some general law governs the flowering of many bamboos and keeps it practically simultaneous.

Under cultivation, on the other hand, the system of simultaneous flowering of some of these species would appear to be breaking down. For instance, *Arundinaria Falconeri* in this country, so far as our records show, first flowered between 1875 and 1877; in the vast majority of cases in 1876. But the flowering of the present generation has already extended over five seasons.

XXXVII.—ACCESSION OF TROPICAL AFRICAN PLANTS FROM 1899–1906.

Otto Stapf.

The accession of tropical African plants to the herbarium during the last seven years has been particularly heavy, and as more than two-thirds were unnamed it was quite impossible to deal with them as they arrived. To avoid duplication of work only those collections which for special reasons had to be dealt with immediately were worked out separately, the bulk of them being pooled and treated as a whole. This involved a considerable but unavoidable delay in completing the determination of the earlier collections. By February last, however, all the tropical African

collections received to that date were worked up, and they are now, together with the named collections acquired during the same period, incorporated in the herbarium.

The following is a list of the collections of phanerogams and vascular cryptogams received from 1899–1906. The figures given do not include duplicates excepting such as were received under different collector's numbers.

Adamson, George, and John Buchanan: Shiré Highlands, 498 specimens (named), communicated by Prof. I. Bayley Balfour on behalf of the Royal Botanic Garden, Edinburgh.

Allen, C. E. F.: Rhodesia, neighbourhood of Victoria Falls, 392 specimens (unnamed).

Appleton, Lt. Col.: Somaliland, between Obbia and Berbera, 100 specimens (unnamed).

Bagshawe, Dr. A. G.: Uganda, 60 specimens (named), communicated by Dr. A. B. Rendle on behalf of the Trustees of the British Museum.

Balfour, Prof. I. Bayley, *see* ADAMSON.

Barthelemy, Rev. M., *see* GARDNER.

Baum, H.: Kunene to Zambesi Expedition, 330 specimens (named), purchased.

Broun, A. F. and Mrs.: Sudan, 233 specimens (named).

Brown, E.: Uganda, 369 specimens (unnamed).

Brown, H.: Sudan, 81 specimens (unnamed), communicated by Prof. Dunstan on behalf of the Imperial Institute.

Buchanan, John, *see* ADAMSON.

Bureau, Prof. L. E., *see* POBÉGUIN.

Busse, Dr. W.: German East Africa, 196 specimens (named), purchased.

Cameron, K. J.: British Central Africa, mostly from the Nyika Plateau, 275 specimens (unnamed).

Cecil, Hon. Mrs. Evelyn: Rhodesia, 147 specimens (unnamed).

Cunningham, J. F.: British Central Africa, between Lake Shirwa and Lake Chiuta, 25 specimens (unnamed).

Dalziel, Dr. J. M.: Northern Nigeria, 287 specimens (unnamed).

Dawe, M. T.: Uganda, 905 specimens (partly named).

Dawodu, T. B.: Lagos, 323 specimens, communicated by Sir W. MacGregor.

Denton, Sir G. C.: Lagos, 62 specimens (unnamed).

Dinklage, M. J.: Liberia, 15 specimens (named), purchased.

Drake-Brockman, Dr. R. E.: Somaliland, 74 specimens (unnamed), communicated by the Colonial Office; 257 specimens (unnamed), communicated by Prof. W. R. Dunstan on behalf of the Imperial Institute.

Dudgeon, G. C.: Gambia, 8 specimens (unnamed), communicated by Prof. W. R. Dunstan on behalf of the Imperial Institute.

Dunstan, Prof. W. R., *see* BROWN, H., DRAKE-BROCKMAN, DUDGEON, ELLIOTT, W.R.

Elliott, C. F.: British East Africa, mostly from Nairobi, 242 specimens (unnamed).

Elliott, W. R.: Northern Nigeria, 162 specimens (unnamed), communicated by Prof. W. R. Dunstan on behalf of the Imperial Institute.

Engler, Prof. A., *see* GOETZE, HEINSEN, PREUSS, SCHEFFLER, THOMAS.

Farmar, Leo: Sierra Leone and French Guinea, 434 specimens (partly named), communicated by Viscount Mountmorres on behalf of the Institute of Commercial Research in the Tropics, of the University of Liverpool.

Foster, E. W.: Lagos, 186 specimens (unnamed).

Gardner, T.: Rhodesia, mostly from the neighbourhood of Bulawayo, 97 specimens (unnamed), communicated by the Rev. M. Barthelemy.

Goetze, W.: German East Africa, "Nyasa-Sea and Kinga Expedition" (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Gosling, Capt. G. B.: Northern Nigeria, 11 specimens (unnamed).

Gossweiler, J.: Angola, 1,020 specimens (partly named), communicated by Prof. J. A. Henriques on behalf of the Coimbra Botanic Garden.

Grenfell, A. P.: British East Africa, Taita Hills, 52 specimens (unnamed).

Heinsen, Dr.: German East Africa, Usambara, 50 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Henriques, Prof. J. A., *see* GOSSWEILER.

Henry, Dr. A., *see* KESTEVEN.

Holland, J. H.: Southern Nigeria, Old Calabar Division, 140 specimens (unnamed).

James, Sir Evan: British East Africa, Aberdare Mountains, 136 specimens (unnamed); Uganda, Nandi, Kitoshi, spurs of Mount Elgon, 198 specimens (unnamed).

Johnson, W. H.: Gold Coast, 168 specimens (unnamed).

Johnson, Archdeacon: Portuguese East Africa, East Coast of Lake Nyasa, 136 specimens (unnamed).

Johnston, Sir. H. H., *see* REYNOLDS, SIM, and WHYTE.

Junod, Henri A.: Eastern Transvaal (partly south of the tropic), 240 specimens (unnamed), purchased.

Kässner, Theodor: British East Africa, 560 specimens (unnamed), purchased.

Kentish-Rankin, L.: Northern Nigeria, 40 specimens (unnamed).

Kesteven, Lord: Barotse Country, 15 specimens (unnamed), communicated by Dr. A. Henry.

Klaine, R. P.: West Africa, Gaboon, 234 specimens (named), communicated by Dr. L. Pierre.

Kolbe, Rev. F. C.: Rhodesia, mostly in the neighbourhood of the Victoria Falls, 54 specimens (unnamed), communicated by the St. Mary's Herbarium, Cape Town.

Last, J. T.: Zanzibar, 27 specimens (unnamed).

Leslie, J. C.: Southern Nigeria, Asaba Division, 13 specimens (unnamed).

Linton, A.: British East Africa, 166 specimens (unnamed).

Lort-Phillips, Mrs. E.: Somaliland, 113 specimens (unnamed).

Lugard, Capt. E. J. and Mrs.: Ngamiland, 285 specimens (unnamed).

Lyne, R. N.: Zanzibar, 164 specimens (unnamed).

MacGregor, Sir W., *see* Dawodu.

MacLeod, N.C.: Southern Nigeria, 30 specimens (unnamed).

McClounie, J.: British Central Africa, mostly from the Nyika Plateau, 358 specimens (unnamed).

Mahon, J.: Uganda, 116 specimens (unnamed).

Manning, Lt. Col. W.H., *see* PURVES.

Mountmorres, Viscount, *see* FARMAR.

Muriel, C. E.: Sudan, 289 specimens (unnamed).

Newton, F.: Cape Verd Islands, 33 specimens (unnamed), communicated by Mr. Isaac Newton.

Newton, Isaac, *see* NEWTON, F.

Pearson, Prof. H. H. W.: German South West Africa, Damaraland, 39 specimens (unnamed).

Pierre, Dr. L., *see* KLAINE.

Pobéguin, H.: French Guinea, 50 specimens (unnamed), communicated by Prof. L. E. Bureau on behalf of the Muséum d'Histoire Naturelle, Paris.

Powell, H.: British East Africa, 103 specimens (unnamed).

Preuss, Dr. P.: Cameroons, 102 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Punch, C.: Lagos, 161 specimens (unnamed).

Purves, J. M.: British Central Africa, 375 specimens (unnamed), communicated by Sir Alfred Sharpe and Lt. Col. W. H. Manning.

Rendle, Dr. A. B., *see* BAGSHAWE.

Reynolds, H.: Liberia, 16 specimens (unnamed), communicated by Sir H. H. Johnston on behalf of the Liberian Chartered Company.

Scheffler, E.: German East Africa, Usambara, 55 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Sharpe, Sir Alfred, *see* PURVES.

Sim, D.: Liberia, 36 specimens (unnamed), communicated by Sir H. H. Johnston, on behalf of the Liberian Chartered Company.

Smythe, C. W.: Sierra Leone, 49 specimens (named).

St. Mary's Herbarium, Cape Town, *see* KOLBE.

Talbot, P. A.: Northern Nigeria, 10 specimens (unnamed).

Thomas, F.: British East Africa, Witu, 108 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

Thompson, H. N.: Southern Nigeria, Benin Division, 30 specimens (unnamed).

Thomson, Major D.: Somaliland, 93 specimens (unnamed).

Unwin, Dr. A. H.: Southern Nigeria, 35 specimens (unnamed).

Urban, Prof. I., *see* WARNECKE.

Warnecke,—.: West Africa, Togoland, 11 specimens (named), communicated by Prof. I. Urban on behalf of the Botanic Garden and Botanic Museum, Berlin.

Wellby, Capt. M. S.: South Abyssinia, 100 specimens (unnamed).

Wellman, Dr. F. C.: Angola, 73 specimens (unnamed).

Whyte, Alexander: Uganda, 576 specimens (unnamed); British East Africa, 286 specimens (unnamed); Liberia, 306 specimens (unnamed) (partly collected with D. Sim), communicated by Sir H. H. Johnston on behalf of the Liberian Chartered Company.

Zenker, G.: Cameroons, 1546 specimens (named), purchased.

Various Collectors:—

(*a*) A set of *Combretaceae* and *Melastomaceae*, 37 specimens (named), communicated by Prof. A. Engler on behalf of the Botanic Garden and Botanic Museum, Berlin.

(*b*) A set of *Gramineae*, 24 specimens (partly named), communicated by Prof. L. E. Bureau, on behalf of the Muséum d'Histoire Naturelle, Paris.

The total number of specimens contained in these collections is 14,627, of which 11,740 were presented and 2,887 purchased. About 10,000 specimens were received unnamed and had to be identified. So far as the specimens belonged to families published in the recent volumes (1899–1906) of the Flora of Tropical Africa, they have been recorded in their places, whilst others formed the foundation of a considerable number of new species described in the *Kew Bulletin* (vols. for 1901, 1906 and 1907), and *Hooker's Icones Plantarum.*

Whyte's, Sim's and Reynold's new Liberian species formed the subject of a paper "Contributions to the Flora of Liberia" by Dr. O. Stapf (*Journ. Linn. Soc.* xxxvii., pp. 79–115); whilst the whole of their collections were taken up in the same author's

paper, "The Known Plants of Liberia," in Sir H. H. Johnston's Liberia, vol. ii., pp. 570–668 (with numerous illustrations by Miss M. Smith). A list of Dawe's Uganda collection was published in that gentleman's official "Report on a Botanical Mission through the Forest Districts of Buddu and the Western Nile Provinces of the Uganda Protectorate" (Parliamentary Blue Book, Cd. 2904), and the new species collected by him were described in "Plantae Daweanae in Uganda lectae" by Dr. O. Stapf in collaboration with T. A. Sprague, R. A. Rolfe, C. B. Clarke, M. T. Dawe, and C. H. Wright (*Journ. Linn. Soc.* xxxvii., pp. 495–544, tt. 21 and 22). Lieut.-Col. Appleton's, Dr. Drake-Brockman's and Mrs. Lort-Phillip's Somaliland collections were particularly rich in *Gramineae* and enabled Dr. Stapf to give a general account of the Grass Flora of Somaliland (*Kew Bulletin*, 1907, pp. 203–228). Finally a paper on the Flora of Northern Nigeria is in preparation, based to a great extent on the collections from that country enumerated in the above list.

The lower Cryptogams (Mosses, Liverworts, Algae, Lichens, Fungi) are not included in the figures given, for the simple reason that they have been almost completely neglected by the collectors; but it is to be hoped that attention will in the future be paid to these plants, the more so as they are, in most cases, easy to collect. It should not be forgotten that they form a very important part of the vegetation, and the flora of no country can be considered properly explored without their being included.

XXXVIII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: IV.

NEW AND ADDITIONAL SPECIES OF FUNGI: SECOND SERIES.

(With Plate.)

G. Massee.

It has already been necessary to make a first addition to the list of *Fungi* occurring in the Royal Botanic Gardens, published in the *Wild Fauna and Flora of the Royal Botanic Gardens, Kew* (*Kew Bulletin: Additional Series* V., pp. 103–187; 223). This additional list is to be found in *Kew Bulletin* for 1906, No. 2, pp. 46, 47. To that list it is now necessary to add the species enumerated below.

AGARICACEAE.

Collybia retigera, *Bresad.* On a dead beech stump, Queen's Cottage Grounds, *A. D. Cotton.*

The second record for Britain, having previously been recorded from the New Forest. The surface of the pileus is ornamented with irregularly anastomosing, raised veins or ridges.

Pleurotus atrocoeruleus, *Fries.* On a decaying beech trunk, Queen's Cottage Grounds, *G. Nicholson.*

Hypholoma peregrinum, *Massee.*

Pileus carnosus, e convexo explanatus, margine repando, demum striato, viscidulus, luteo-virescens, fibrillis fulvo-auroreis obtectis, centro squamoso hirtus, 3–4 cm. latus. *Lamellae* confertissimae, angustae, ventricosae, postice sinuato adnexae, ex albis purpureo-fuscae, acie fimbriata, alba. *Stipes* pallidus, fistulosus, fibrillosus, aequalis, 2–3 cm. longus, 2 mm. crassus. *Sporae* ovato-oblongae, basi apiculatae, episporio subtiliter punctato-scabro, 5 × 3 μ. *Basidia* clavata. *Cystidia* ampulliformia, 65–75 × 6–7 μ. Sapor mitis.

Gregarious on decaying wood in the Tropical Fern House, *W. B. Little.*

This is in all probability an introduced species, bearing some resemblance to *Hypholoma atrichum*, Berk., from India, but differing in the narrow, very closely crowded gills, flattened (not umbonate) pileus, and smaller spores.

Gomphidius viscidus, *Fries.* On the ground under conifers, Queen's Cottage Grounds, *A. D. Cotton.*

Remarkable for the tough, elastic substance of the entire fungus, and the large fusiform, olive-coloured spores.

Coprinus Spraguei, *Berk. & Curtis.* On the ground among moss, Queen's Cottage Grounds.

Differs from every other British species of *Coprinus* in having a coloured stem.

Polyporaceae.

Boletus granulatus, *L.* On the ground under conifers, Queen's Cottage Grounds, *A. D. Cotton.*

One of the best of the edible species of *Boletus*. Much appreciated as an article of food by squirrels.

Polyporus armeniacus, *Berk.* On dead wood lying on the ground, Queen's Cottage Grounds, *G. Nicholson.*

Snow-white when growing, changing to deep cinnamon when dry.

Thelephoraceae.

Cyphella Pimii, *Phil.* On dead nettle stems, Arboretum.

Hydnaceae.

Odontia Pruni, *Lasch.* On rotten wood, Queen's Cottage Grounds, *G. Nicholson.*

New to Britain. Distribution ; France, Germany, Italy.

Clavariaceae.

Pterula multifida, *Fries.* Growing in a dense cluster at the base of dead fern stipes, Herbaceous ground, *W. Irving.*

Pezizaceae.

Belonidium pruinosum, *Massee.* On dead branches, Queen's Cottage Grounds.

A minute white fungus growing in dense clusters. The mealy or pruinose appearance of the disc is due to the great accumulation of spores, which, on escaping from the asci, are not disturbed by currents of air as in most of the *Pezizae*, but remain on the surface of the fungus until they have germinated. The object of this exceptional arrangement is at present unknown.

Dasyscypha trichoidea, *Sacc.* On fallen pine leaves, Queen's Cottage Grounds, *G. Nicholson.*

Helotium Amenti, *Fckl.* On dead fallen alder catkins, Arboretum, *G. Nicholson.*

Ascobolus Crouani, *Boud.* On old rotten sacking, Melon ground, *C. P. Raffill.*

A beautiful little green fungus, a colour rarely met with in fungi.

Sphaeriaceae.

Chaetomium lageniforme, *Corda.* On dead fallen alder twig, Queen's Cottage Grounds, *G. Nicholson.*

New to Britain.

Xylaria Culleniae, *Berk. & Broome.* On bamboo flower stake, *H. M. Woolley.*

This fungus is an introduced species from Ceylon. It is not uncommon in the gardens, and shows a preference for bamboo.

Gymnoascaceae.

Endomyces Magnusii, *Ludwig.*

This is one of the organisms always present in the "slime-flux" or glairy substance dripping from the large weeping wounds often present on the trunk or larger branches of various kinds of trees. There are several very large wounds of this nature on the horizontal branches of a horse chestnut, growing just within the north entrance to the Queen's Cottage Grounds.

Saccharomycetaceae.

Saccharomyces Ludwigii, *Hansen.*

This yeast is one of the organisms present in the disease called "slime-flux." The yeast promotes fermentation and converts the cellulose cell-walls into a soluble substance, which oozes from the wound, more especially during rainy weather, under the form of diluted, frothy gum.

Melanconiaceae.

Diplodia ilicicola, *Desm.* On dead holly leaves, Queen's Cottage Grounds, *G. Nicholson.*

Dilophospora Graminis, *Desm.* On the inflorescence of *Holcus mollis*, Arboretum, *G. Nicholson.*

This fungus is a true parasite, and is not uncommon on the living inflorescence of various kinds of grass. Infection occurs when the inflorescence is quite young, and enclosed within the sheath, and when it emerges it is more or less completely covered with a dense black felt of hyphae, in which the numerous minute perithecia are embedded. It sometimes proves very destructive to cereals, more especially wheat.

Pyrenochaeta Phloxidis, *Massee.*

Perithecia dense gregaria, in maculis elongatis nigricantibus atra, nidulantia, globosa, erumpentia, membranacea, ostiolo pertusa, setis nigris, rigidis, praecipue ad verticem vestitis, 130–180 μ diam. *Sporae* continuae, ellipsoideae, hyalinae, 5 × 3 μ; basidiis hyalinis bacillaribus suffultis.

On stems of *Phlox* just above the ground-line. This parasite quite destroyed a bed of *Phlox*; the foliage at first assumed a greenish-yellow sickly tinge, and afterwards wilted and fell, followed by the breaking of the stem near the base.

Most nearly allied to *Pyrenochaeta ferox*, Sacc., which differs in the hyaline spines springing from the upper portion of the perithecium, and the much larger spores.

Phoma Callunae, *Karsten.* On dead heather stem, Arboretum, *G. Nicholson.*

Pestalozzia Callunae, *Cesati.* On dead heather stem, Arboretum, *G. Nicholson.*

Pestalozzia truncata, *Lév.* On dead bark of hawthorn and oak, Arboretum, *G. Nicholson.*

Lepothyrium ilicinum, *Sacc.* On dead fallen leaves of *Quercus Ilex*, Arboretum, *G. Nicholson.*

Vermicularia corvina, *Karsten.* On chips, Queen's Cottage Grounds, *G. Nicholson.* New to Britain.

Coryneum microstictum, *Berk. & Broome.* On dead bramble stem, Queen's Cottage Grounds, *G. Nicholson.*

Coryneum pustulatum, *Peck.* On dead branches of horse chestnut, Queen's Cottage Grounds, *G. Nicholson.*

Ascochyta Cookei, *Massee.*

Perithecia dense gregaria, inordinata, in maculis elongatis lutescentibus nidulantia, subepidermica, globosa, ostiolo erumpentia, 70–80 μ lata, basi hyphis mycelialibus septatis, fuligineis praedita. *Sporae* hyalinae, medio septatae, cylindraceo-clavatae, 40 × 4–5 μ.

On living leaves of "Sweet William"—*Dianthus barbatus*, L., *M. C. Cooke.*

This species was collected in Kew Gardens by Dr. Cooke several years ago, and placed in the herbarium under the name of *Ascochyta Dianthi*, Berk., presumably on account of a very close superficial resemblance between the two species; the spores

however are quite different in size and shape, in *A. Dianthi* they are narrowly fusiform, and measure 14–16 × 4 μ, or only about one-third the length of those of *A. Cookei*.

Exosporium laricinum, *Massee*.

Sporodochia atra, erumpente-superficialia, convexo-pulvinata, dein centro depressa, dense aggregata, circa 0·5 mm. diam. *Conidia* crebra; fusiformia, 5-7-septata, hyalina, olivaceo-fuliginea, 25–30 × 6–7 μ, sporophoris brevibus, teretibus, 1-septatis, concoloribus suffulta.

On young living larch branches, Queen's Cottage Grounds.

This fungus is a true parasite, but does little or no direct damage. Indirectly, however, it is sometimes the cause of serious injury as through the minute cracks formed in the living bark, and the extrusion of sap and resin, the spores of the "Larch canker" fungus (*Dasyscypha calycina*, Fckl.) often effect an entrance into the tissues of the host, and as a rule canker follows.

The minute black conidiophores occur in dense clusters at different points on the branch. Allied to *Exosporium Tiliae*, Link, but at once distinguished from this and every other known species by the fusiform conidia.

Septoria Hippocastani, *Berk.* On dead horse-chestnut leaves, Arboretum.

Septoria Aesculi, *Westem.* On dead sweet chestnut leaves, Arboretum.

Septoria Robiniae, *Desm.* On living leaves of *Robinia*, Arboretum.

Septoria Cytisi, *Rabenh.* On living laburnum leaves, Queen's Cottage Grounds.

Septoria Wistariae, *Roumeg.* On living leaves of *Wistaria*, Arboretum.

Hyphomycetaceae.

Oospora candidula, *Sacc.* On dead twigs, Queen's Cottage Grounds, *G. Nicholson*.

Arthroderma Curreyi, *Berk.* On buried beech mast, Queen's Cottage Grounds, *G. Nicholson*.

Cylindrium griseum, *Bonord.* On decaying vegetable matter, Arboretum.

Aspergillus flavus, *De Bary.* On dung of caterpillar of swallow-tail moth,—*Europteryx sambucaria*, L., *A. L. Simmons*. New to Britain.

Clonostachys Simmonsii, *Massee*.

Hyphae steriles repentes, simplices vel breve vage ramulosae, septatae, hyalinae; hyphae fertiles erectae, simplices, supra septatae, ad septos verticillato-ramosae; ramis ramulisque ternis-quinis; ramulis attenuatis, conidiis ubique tectis, spicam aemulantibus. *Conidia* ellipsoidea, hyalina, spinulosa, 6 × 4 μ.

On dung of caterpillar of swallow-tail moth,—*Europteryx sambucaria*, L., *A. L. Simmons.*

A very beautiful and distinct fungus, resembling in miniature a compact bundle of plantain spikes. Every part pure white. Approaches to *Clonostachys Araucaria*, Corda, in habit and general appearance, but differs in the longer fertile spikes and in the larger, spinulose conidia. The fungus appeared on the dung of caterpillars bred from a moth taken in the Queen's Cottage Grounds by Mr. Simmons.

Ramularia Necator, *Massee.*

Sporodochia superficialia, late effusa, filamentosa, nivea ; hyphae steriles repentes, dense intricato-ramosae, septatae, hyalinae, 7–10 μ diam. hinc inde inflatulae. *Basidia* assurgentia, parce ramulosa, ramulis ultimis attenuatis, conidiis elliptico-oblongis, utrinque obtusatis, 3-septatis, ad septa vix constrictis, 25–28 × 7–9 μ.

On the cotyledons of seedlings of *Theobroma Cacao*, L., in the propagating pits.

A batch of Cacao seeds from Jamaica was recently sown, and soon after germination the cotyledons became covered with a dense snow-white mould which eventually killed the seedlings. The fungus is a true parasite and quite distinct from any described species of *Ramularia* ; furthermore, the fungus does not conform with the usual facies of European species belonging to this genus, and it would be interesting to learn whether it has been observed as a parasite on Cacao seedlings in Jamaica.

Milowia amethystina, *Massee.*

Sporodochia pulvinata, laxe gregaria, sessilia, humetecte laete amethystina, 0·5–1 mm. diam. *Sporae* cylindraceo-ellipsoideae, utrinque obtusatae, 7-septatae, hyalinae, 40–50 × 7–8 μ, basidiis hyalinis suffultis.

On damp decorticated wood, Herbarium Grounds, *G. Nicholson.*

The pustules are of a clear amethyst colour when moist and growing, becoming pallid when dry. *Milowia nivea*, Massee, the only species previously known, differs in the snow-white colour and much larger spores.

Stilbum sphaerocephalum, *Massee.*

Sporophora capitata, usque 1 mm. diam., straminea, glabra, demum sporis albido-pruinosa. *Stipes* subteres, compressusve, laevis, in capitulum diffusus, concolor, basi incrassatus, fuscus, 2 mm. longus, 0·1 mm. crassus. *Sporae* ellipsoideae, hyalinae, 7 × 3 μ.

On wounds of living stem of *Philodendron*, growing in the Aroid house.

The plants grow singly or in small clusters. The general aspect is that of a miniature drumstick, the head or spore-bearing portion being at first obpyriform, then globose and frosted with a dense layer of spores. This appearance is probably due to the fact that the fungus was growing in a constantly damp atmosphere, and the spores, instead of being removed by wind as they matured, were held together in a damp mass by moisture.

Most nearly allied to *Stilbum connatum*, Kalchbr. & Cooke, differing in the straw-coloured head and stem, and in the smaller spores.

Graphiothecium parasiticum, *Desm.* On very much decayed hawthorn branch, Arboretum, *G. Nicholson.*

Uredinaceae.

Uromyces Dactylidis, *Otth.* The aecidial form on *Ranunculus repens*, L.; uredo- and teleutospore-forms on *Dactylis glomerata*, L., Queen's Cottage Grounds, *G. Nicholson.*

Uromyces Rumicis, *Wint.* On living leaves of *Rumex acetosa*, L., Queen's Cottage Grounds, *G. Nicholson.*

Puccinia Glechomatis, *DC.* On living leaves of *Nepeta Glechoma*. Benth., Queen's Cottage Grounds, *G. Nicholson.*

Explanation of Figures on Plate.

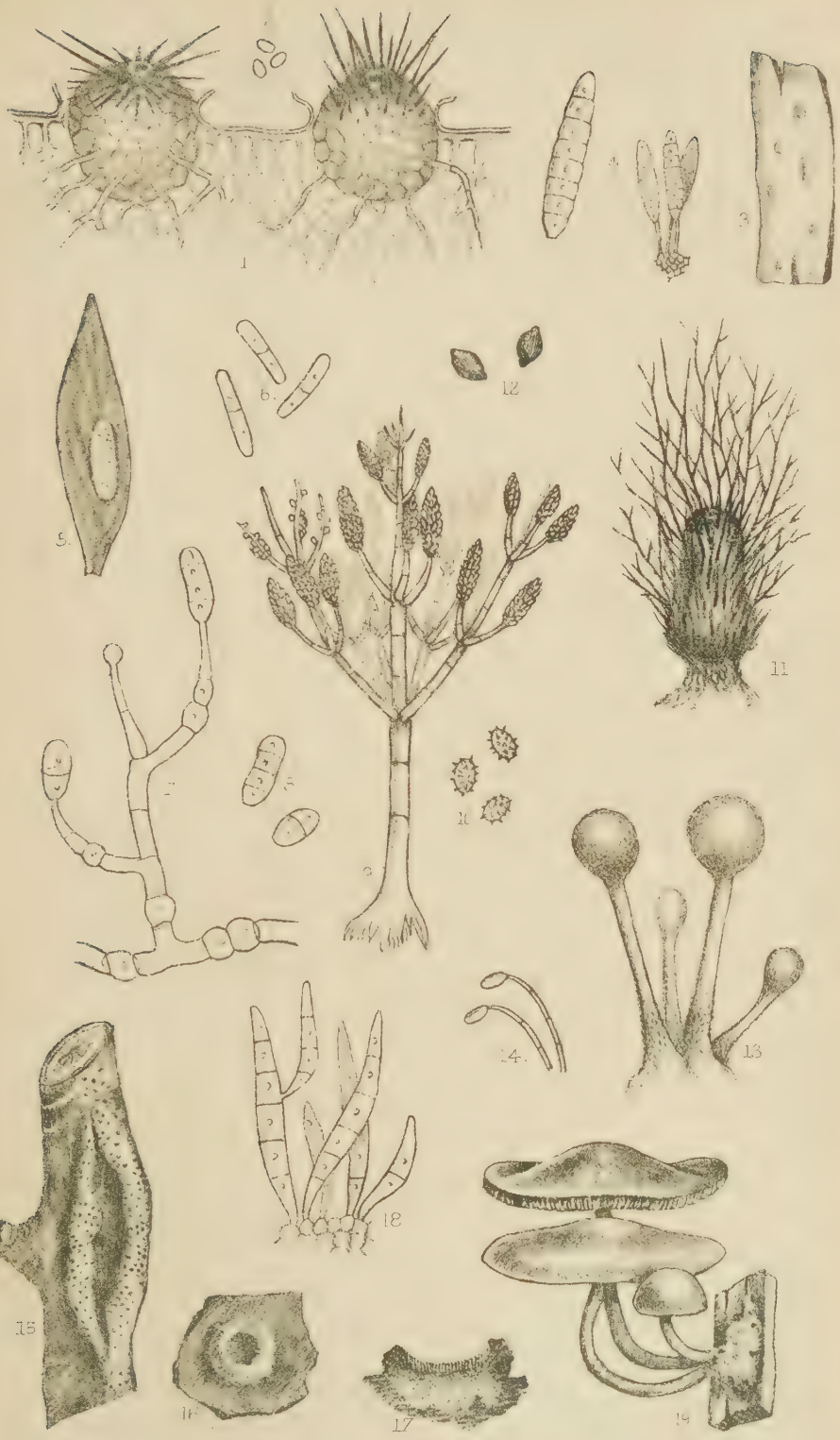
Fig. 1. *Pyrenochaeta Phloxidis*, Massee; section of *Phlox* stem showing two perithecia, mag.
„ 2. Spores of same, highly mag.
„ 3. *Milowia amethystina*, Massee; group of plants on dead wood, slightly mag.
„ 4. Spores of same, highly mag.
„ 5. *Ascochyta Cookei*, Massee; fungus on living leaf of "Sweet William," nat. size.
„ 6. Spores of same, highly mag.
„ 7. Portion of fruiting hypha of *Ramularia Necator*, Massee; highly mag.
„ 8. Spores of same, highly mag.
„ 9. *Clonostachys Simmonsii*, Massee; entire fungus, mag.
„ 10. Spores of same, highly mag.
„ 11. *Chaetomium lageniforme*, Corda; entire fungus, mag.
„ 12. Spores of same, highly mag.
„ 13. *Stilbum sphaerocephalum*, Massee; group of plants, mag.
„ 14. Spores of same supported on tips of hyphae, highly mag.
„ 15. *Exosporium laricinum*, Massee; group of plants on a larch branch, nat. size.
„ 16. A single plant of same seen from above, mag.
„ 17. Section of a plant of same, mag.
„ 18. Group of spores of same, highly mag.
„ 19. *Hypholoma peregrinum*, Massee; nat. size.

XXXIX.—A NEW CHINESE RHODODENDRON.

W. B. Hemsley and E. H. Wilson.

Rhododendron (§ Azalea) **Mariesii**, *Hemsl. et E. H. Wils.*; species critica compluribus plus minusve arcte affinis, *R. Weyrichii*, Maxim., proxima, differt foliis in ramorum apices saepissime terna et gemmarum floriferarum squamis glabris; a *R. rhombico*, Miq., ramulis glabris, foliis lanceolatis pilis longissimis appressis subtus vestitis et squamis latioribus recedit: a *R. Farrerae*, Tate, cum qua cl. Diels haec conjungit, foliis ternis multo majoribus membranaceis minute reticulatis differt.

W. B. H.



New British Fungi.

11 67. 6. 07.

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Bush 1–2 metres high; branches twiggy, grey or reddish, shining. *Leaves* clustered, deciduous, membranous, ovate, acute, excluding petioles 6–7 cm. long, 2·5–3·5 cm. broad, reticulate, base cuneate, glabrescent, clothed with yellowish, silky hairs when young; midrib and primary veins prominent, sparsely pubescent; petioles 4–8 mm. long, dark coloured, glabrescent. *Buds* ovoid; scales broadly ovate or orbicular, apiculate, ciliate, glabrescent without, pubescent within. *Flowers* usually in pairs, rarely solitary, pale purple, 4–5 cm. across; pedicels, enclosed by bud-scales, erect, stout, ·5–1 cm. long, setulose. *Calyx* annular, densely setose. *Corolla* deeply 5-lobed, glabrous; tube narrowly funnel-shaped, 5–10 mm. long; lobes twice the length of the tube, spreading, elliptic, rounded or obtuse. *Stamens* 10, shortly exserted; filaments 2–2·5 cm. long, glabrous, curved in upper half. *Pistil* much exceeding stamens; ovary 4–5 mm. long, densely setose; style 3–3·5 cm. long, curved upwards, glabrous. *Fruit* about 1·5 cm. long, 6 mm. broad, setose.—*R. Farrerae*, var. *Weyrichii*, Diels, in Engl. Jahrb. vol. xxix., p. 513.

E. H. W.

Central China: Western Hupeh, at 200–600 metres, *Wilson*, 29; Changyang, *A. Henry*, 5274, 5947; Patung, *A. Henry*, 1422; Nanto and mountains to the northward, *A. Henry*, 3829; Kiukiang, Kiangsi, *Maries*.

Dr. Henry's dried specimens, and some others, were doubtfully referred by me (*Journ. Linn. Soc.* vol. xxvi., p. 32) to *R. Weyrichii*, Maxim.

Raised at Kew from seeds sent home by Dr. Henry in 1886, and flowered in the Temperate House in April, 1907.

Dr. L. Diels, in the place cited above, reduces *R. Weyrichii*, Maxim., *R. leucotrichum*, Franch., the specimens here referred to *R. Mariesii*, Hemsl. and E. H. Wils., and some others, to *R. Farrerae*, Tate. This treatment leads me to suspect that he may not have had specimens of genuine *R. Farrerae* before him, because this, in my opinion, is one of the most distinct and least variable of the species of the section *Azalea*; and Maximowicz, in contrasting his *R. Weyrichii*, a Japanese species, with the Hongkong *R. Farrerae* says:—"A praecedente optime differt." *R. Farrerae*, Tate (Sweet's Brit. Fl. Gard. 1831, series 2, t. 95), is a low, very densely branched bush with thick, stiff leaves strongly reticulated on the under surface, with usually solitary flowers and more hairy flower-buds.

The investigation of this group of species has led to the discovery of some facts in the history of *R. Farrerae* that seem worth recording. It is a native of the mountains of Hongkong and the neighbouring part of the mainland, as stated in the *Journal of the Linnean Society*, vol. xxvi., p. 23. Among the collectors of the species is one named Tate, who collected both on the mainland and in the island, in 1862–3. This was G. R. Tate, M.D., an army surgeon, who was stationed at Hongkong during the years named. The Tate to whom Sweet attributes the authorship of the name *Farrerae* was not, however, Dr. Tate, but a nurseryman in Lowndes Street, as we learn from Loudon's

Gardener's Magazine, vol. vii. (1831), p. 474, for whom Captain Farrer, of the East Indiaman "Orwell," brought home several living plants; this Mr. Tate proposed the name in compliment to Mrs. Farrer. But the species was made known to the Horticultural Society of London in the first instance by John Reeves, who presented the Society with drawings and specimens. This was the Reeves who, in 1858, introduced the plant of *Wistaria chinensis* which until recently was one of the notable features of the Chiswick Garden. Fortune re-introduced *R. Farrerae* about 1846 and Lindley, overlooking its previous publication, described it under the name of *Azalea squamata* in the *Journal of the Horticultural Society*, vol. i., p. 152, and in 1847 a coloured figure of it appeared in the *Botanical Register*, t. 3.

W. B. H.

XL.—MISCELLANEOUS NOTES.

Mr. Frank Henry Butcher and Mr. Edmund George Stroud, members of the Gardening Staff of the Royal Botanic Gardens, have been appointed by the Secretary of State for India in Council, on the recommendation of Kew, probationer gardeners for service in India.

Abraham Dixon.—The death of this gentleman, an old correspondent of Kew, is announced as having taken place on April 30, at the great age of 92 years. He was an enthusiastic horticulturist with sufficient means to gratify his taste for the pursuit, and he was specially interested in tropical plants of economic value. His first letter in the Kew archives is dated from Birches Green, Birmingham, February 23, 1867, advising the despatch of seeds of Coca* and seeds and fibre of 'Bimba Cotton,' and requesting an interview to discuss the cultivation of tropical fruits, concerning which he wrote: "I and my gardener have unfortunately much more zeal than knowledge." In spite of their want of knowledge, he must have had various tropical fruit-trees under cultivation for some years at that date, because in a communication of the following year he says: "I now write to say that I have a valuable and, I believe, an unusually well selected collection of tropical fruit-trees which I have imported myself during the last few years from the East and West Indies and South America, but which I have now some intention of placing elsewhere, because I am preparing to change my residence from here to a small estate which I have purchased near Dorking." He was prepared to present the collection, on which he had spent much money, to Kew, on the condition that if in the future he should be able to resume "the interesting and attractive attempts

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* This was the *Erythroxylon Coca*, var. *novo-granatense* (*Kew Bulletin*, 1889, p. 5); hundreds of plants were raised and distributed to numerous correspondents in various parts of the world.

to fruit these plants," he would receive such assistance as Kew could afford him. But in consequence of Mr. Dixon going abroad, the plants were not sent to Kew till August, 1869. There was a railway truck load of them, made up as follows :—*Garcinia Mangostana*, 7 plants; *G. cochinchinensis*, 1; *Anona squamosa*, 9; *A. palustris*, 2; *A. Cherimolia*, 5; *Persea gratissima*, 4; *Averrhoa Carambola*, 2; *Achras Sapota*, 4; *Baccaurea dulcis*, 1; *Artocarpus integrifolia*, 1; *Erythroxylon Coca*, 12; *Mangifera indica*, 1; and *Nephelium lappaceum*, 1.

In 1871 Mr. Dixon wrote from Cherkley Court, his new estate near Leatherhead, where he had built himself a residence and begun laying out his garden, which soon became famous. He particularly mentions his "wood of 60 to 80 acres of dense and fine old yews," and adds : "I hope that some day you will allow me the pleasure of showing you this old druidical grove. I think it must be one of the largest extant." Lowe, in his *Yew-trees of Great Britain and Ireland*, 1897, describes it as perhaps the finest collection of yews in existence.

Mr. Dixon again took up the cultivation of tropical economic plants. He had also a very fine collection of aquatic plants, for which he constructed a special house, and he was particularly successful with the *Victoria regia*.

For many years he continued in correspondence with Kew, and exchanged seeds and plants to the mutual benefit of both parties.

In September, 1893, his residence was burnt down in the night, and much was destroyed, but he rebuilt it and returned to enjoy many years among his favourite plants.

His last letter to Kew is dated May 19, 1899, and in this he agrees to the Director's suggestion that a plant of the 'Gordon Lily,' which he had presented to Kew, should be sent to the Queen's garden at Frogmore.

W. B. H.

Portrait of Mr. Gustav Mann.—A medallion portrait of this gentleman has recently been presented to Kew. There are few persons alive now who can remember that he was the pioneer in the botanical exploration of the mountains of Western Tropical Africa. He succeeded the unfortunate Charles Barter as Botanical Collector for Kew, on Dr. Baikie's Niger Expedition in 1859, with remarkable and valuable results, mainly published in the *Journal* and *Transactions of the Linnean Society*. In the sixth volume of the *Journal* will be found Mann's highly interesting narrative of the ascent of Clarence Peak (10,700 ft.), Fernando Po, and Sir Joseph Hooker's enumeration of the plants; and in the seventh volume of the same publication Mr. Mann describes his expedition to the Cameroons, on which he was equally successful. He reached the summit, which he estimated, from the boiling point of the thermometer, to be 12,271 feet, and he made a very full collection of the plants of the temperate region, which afforded Sir Joseph Hooker materials for a most interesting comparison with the flora of the mountains of

Abyssinia. Mr. Mann also made large collections in the tropical region, including many remarkable new genera. The Palms of the expedition were published by him, jointly with H. Wendland, in the twenty-fourth volume of the *Transactions of the Linnean Society*. Mr. Mann subsequently served with distinction in the Indian Forest Department, from which he retired a few years ago, and now lives near Munich.

W. B. H.

Botanical Magazine for June.—The plants figured are : *Rhododendron Delavayi*, Franch. ; *Tamarix pentandra*, Pall. ; *Eupatorium glandulosum*, H. B. K. ; *Gentiana ornata*, Wall. ; and *Dendrobium Ashworthiae*, O'Brien ; all, excluding the *Dendrobium*, being in cultivation at Kew. The *Rhododendron* is a native of South-western China, and is very closely allied to the well-known *R. arboreum*, Smith, but may be distinguished by the intense red of its flowers with black blotches on the inside. The drawing was prepared from a specimen obtained from the garden of Mr. Thomas Acton, of Kilmacurragh, Wicklow, and sent to Kew by Mr. F. W. Moore, of Glasnevin. *Tamarix pentandra* is found in a wild state from the Balkan Peninsula, through Southern Russia, to Turkestan, and from Asia Minor to Persia. It is a very ornamental plant allied to *T. gallica*, L., with which it has been confused. The Kew plants were purchased from a Belgian nurseryman. *Eupatorium glandulosum*, a fine white-flowered Mexican species, is an old garden plant, having been introduced in 1826. The drawing was made from a plant which flowered at Kew in March, 1906. *Gentiana ornata* is a native of Alpine Central and Eastern Himalaya. It is a small herb about 6 inches high, with usually narrow leaves and solitary terminal blue flowers about $1\frac{3}{4}$ inch long. It is pointed out that the plant figured at t. 6514 under the same name is evidently a different species, resembling *G. nipponica*, Maxim. The plant of *G. ornata* was presented to Kew in 1905 by Mr. Max Leichtlin, of Baden-Baden. The *Dendrobium* belongs to the section *Dendrocoryne*, which includes, amongst others, *D. atroviolaceum*, Rolfe, and *D. Madonnae*, Rolfe, figured at tt. 7371 and 7900 of the Magazine. It was introduced from New Guinea by Messrs. F. Sander & Sons about seven years ago. The plant figured, probably the only one now in Europe, was kindly lent to Kew by Sir Trevor Lawrence, Bart.

Notes from Northern Nigeria.—The following information, contained in a letter to Kew, dated May 11, 1907, from Mr. W. R. Elliott, Conservator of Forests, Northern Nigeria, in reply to enquiries regarding the experimental station established at Lokoja in that province, seems so interesting as to deserve publication :—

"With regard to your question referring to the Botanic Station formed at Lokoja, I would point out that it can hardly be termed a Botanic Station. A piece of forest situated near Lokoja was

declared a forest reserve, and our main efforts have been directed, so far, to the propagation and planting of the different rubbers, especially *Funtumia elastica*.

"At the beginning of 1906, large nurseries of *Funtumia* were formed, and later on over 100 acres of the Lokoja reserve—which is about 250 acres in extent—were planted up, and the remainder will be done this year.

"In addition to this, 40 acres of forest were planted up on the Gurane River, where we have a reserve of over 400 square miles, and a further 40 acres at Dakini in the Basse Province.

"The idea we are working on is to get the natives to plant up the forest surrounding their towns and villages with *Funtumia*.

"Para rubber is also being grown experimentally in the Lokoja reserve, and I have no doubt will be a success in the southern parts of the Protectorate. The different Landolphias have also been planted in the reserve with a view of experimenting with them as to what extent the roots can be tapped without injuring the plants and to discover improved methods of tapping the vines and coagulating the latex.

"At present the country is being rapidly denuded of Landolphias owing to the destructive methods of collecting the root rubber, the whole of the roots being dug up and pounded.

"There are no planting operations of a private nature in Northern Nigeria, if one excepts the work of the British Cotton-growing Association Model Farm near Lokoja.

"There is no doubt that the cultivation of Para rubber and *Funtumia* could be successfully undertaken in the southern parts of the Protectorate, but the question of European supervision is a somewhat serious one, and unless the thing was taken up on a large scale it would not pay. European supervision means large pay, payment leave, and passages home and out; and to ensure continuity in the work, the European staff would have to be double what it is in other places.

"Our forest reserve on the Gurane River is full of splendid Mahogany—*Khaya senegalensis*—and Ebony—*Diospyros mespiliformis ?*—as well as many other valuable timber trees. By the new Forestry Proclamation the cutting of these trees is forbidden excepting under the supervision of the Forestry Department, and it is hoped that a stop will be put to the cutting of young trees for firewood.

"There is no doubt that there is a great future for Northern Nigeria in cotton. Every village grows its own cotton, and in many cases manufactures its own cloth, and I think every effort should be made to select the best variety of native cotton and distribute the seeds throughout the country. During 1906 the British Cotton-growing Association got as much cotton as they could deal with in their ginnery at Lokoja, and they are making arrangements to deal with a much larger quantity this season. Tobacco is also largely grown in the Protectorate, some of it of very good quality."

Bitter Pit in Cape Apples.—Since the publication of previous notes on this subject (*K.B.* for 1906, pp. 193–5, and *K.B.* for 1907, pp. 142–4), it has transpired that prior to the official reference of this interesting question to Kew for report, on 26th March, 1906, the subject had already been placed in the very competent hands of Professor J. B. Farmer, F.R.S., Royal College of Science, South Kensington, for investigation. Knowing the great interest taken in the matter at Kew, and sharing our feeling that it is desirable to place at the disposal of all who are, or are likely to become, interested in the subject the whole of the information as yet available, Professor Farmer has very kindly supplied the subjoined note for the information of readers of the *Kew Bulletin* :—

"With reference to the note on Bitter Pit in Cape Apples which appeared in the *Kew Bulletin*, No. 4, 1907, I should like to say that my own attention was called to the disease about 18 months ago by Dr. Horace Brown, who showed me some specimens preserved in spirit. I was introduced by him to the Cape Orchard Company, who were good enough to send me several consignments of various sorts of apples for investigation. In the badly attacked sorts (*e.g.*, Northern Spy) the disease was not confined to any special region of the apple. All attempts to establish a fungal or bacterial origin for the disease failed. No trace of either could be seen in sections of the fruit, either fresh or preserved in the fixations commonly employed in microscopic technique. This is of itself not conclusive, for it is well known how easily the parasite may escape detection under these conditions. But cultural experiments carried on on a rather large scale also failed to reveal the slightest trace of any existing parasite.

"Furthermore, the disease seems, as Mr. Davis states, always to develop *within* the flesh of the apple, and to extend outwards to the skin. Several of the samples I received showed no traces of the disease till they were cut open, and then the characteristic brown spot was easily enough identified. Thus it seems clear that the disease is connected with—at present—obscure physiological causes which can only be investigated on the spot, unless it should turn out that some plant louse or other animal starts the mischief by boring into the fruit when very young. There is, however, one peculiarity connected with the affected tissue which seems to me to be of great interest, and which will have to be borne in mind in seeking for the explanation of the origin of the malady. The cells of the affected area are always full of starch, and stand out in this respect in marked contrast to the surrounding healthy tissue. Either the pathological condition tends to effect the formation of the starch, or, as I think is more probable, the action of diastase is locally inhibited. This might arise from the inability of sugar to pass out of the infected cell, and so by increasing its concentration, to maintain a high starch content, or it might be due to a more directly prejudicial action on the diastase itself. The cell walls undergo a kind of pectic degeneration, and react in a marked degree to Ruthenium Red. The whole disease bristles with points of physiological interest, but they can only be hopefully attacked on the spot."